Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

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Reaches Largest Number of Plants

Vol. XIX | OCTOBER 23, 1929 | No. 2

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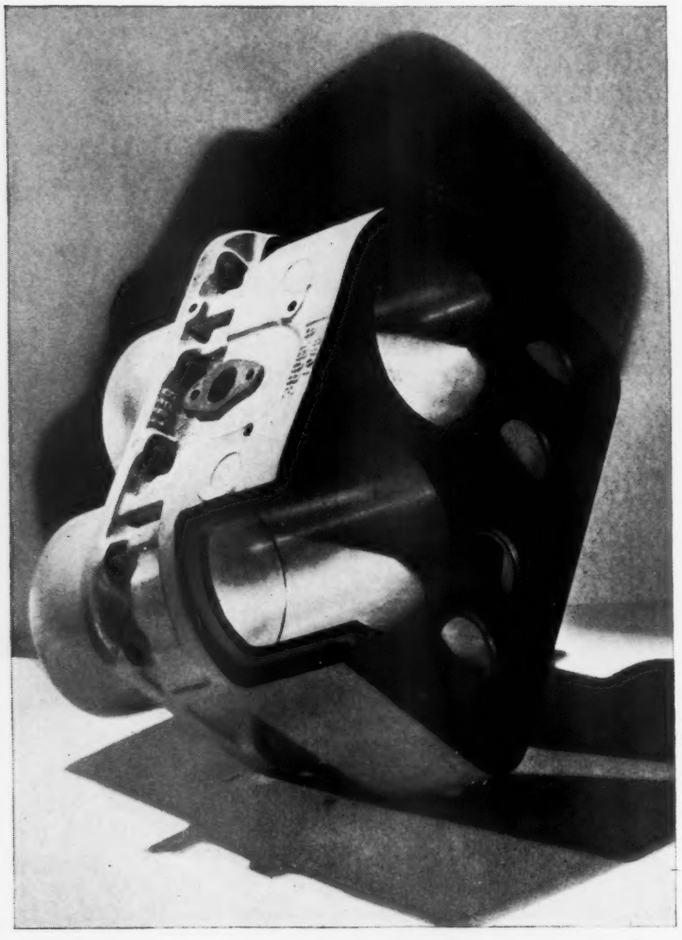

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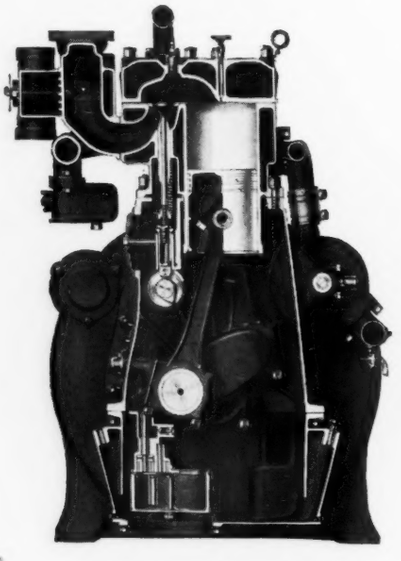
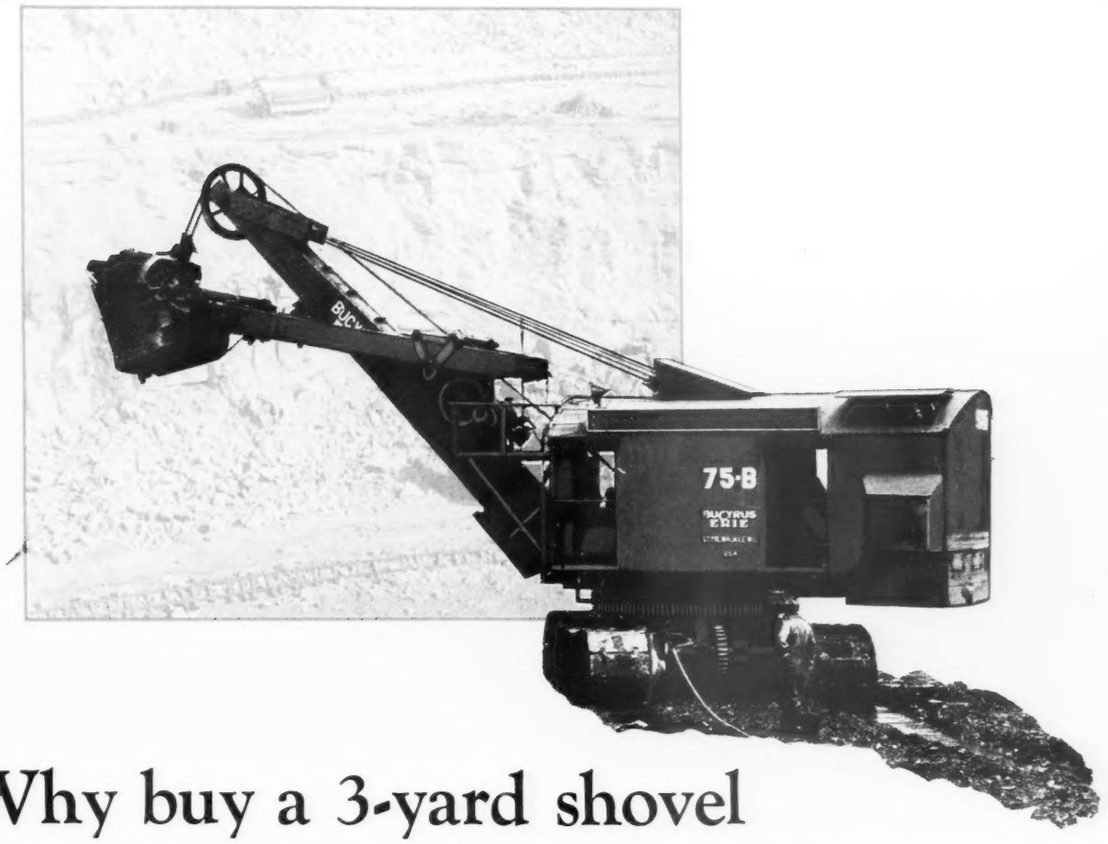


Cross Section of 4-Cylinder Super-Duty Waukesha Engine.

973



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Adv. 812

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ARTHUR J. HOSKIN, *Editor*
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G. B. MASSEY, *Associate Editor*
G. F. SONDRAKER, *Associate Editor*

New York Representative:
L. M. WEISS, 315 W. 86th St.; Telephone, Schuyler 6294; New York, N. Y.

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CEMENT-MILL & QUARRY

Vol. XIX CHICAGO, OCTOBER 23, 1929 No. 2

Vulcanite Portland Cement Company Operates Three Plants Around One Large Quarry

By F. A. WESTBROOK

ASIDE from its very large size, probably the most striking thing to the interested observer of the operations of the Vulcanite Portland Cement Company near Phillipsburg, N. J., is the attitude of the management toward the personnel question. What more convincing comment on this most important matter can be made than the following brief tabulations showing the terms of service of the operating staff, as of May 31, 1928.

Position	Years Service	Age (Yr)
Receiving clerk	34	55
Works' manager	33	68
General pipe-gang foreman	31	64
No. 3 mill foreman	31	52
Storekeeper	30	45
Shipping clerk	30	63
Time clerk	30	48
Chief chemist	30	49
General foreman mill	29	46
Paymaster and chief clerk	29	50
Assistant chemist	28	48
Mill and carpenter foreman	26	54
General repair foreman	24	57
Quarry foreman	23	54
Yardmaster	22	69
Metal-work foreman	22	39
Mason foreman	22	44
No. 3 mill foreman	21	61
Chief and mechanical engineer	18	53
Belt foreman	15	50
Machine-shop foreman	12	59
No. 3 yard foreman	10	56
No. 2 mill foreman	10	58
Electrician	9	40
Bag repair foreman	8	50
No. 2 mill foreman	7	50
General foreman mill No. 2	7	34
Constructing engineer	6	37
Metal-worker foreman No. 2	6	44
Power engineer	5	58

April 26, 1929

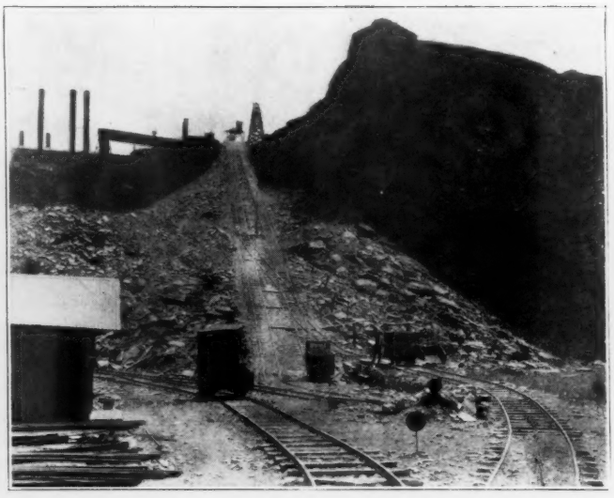
Employees as tabulated show the following percentages, by age:

W. R. Dunn, assistant to president, and managing director, Vulcanite Portland Cement Company

Age in Years	Number	Percentage
16 to 20	12	2.60
21 to 30	100	21.69
31 to 40	115	24.95
41 to 50	137	29.72
51 to 60	73	15.83
61 to 70	20	4.34
71 to 79	4	.87
	461	100.00

Those over 40 years of age represent more than 50 per cent of the total. Seventy-five per cent of the men average 8 years service each; the works' executives average 17 years each.

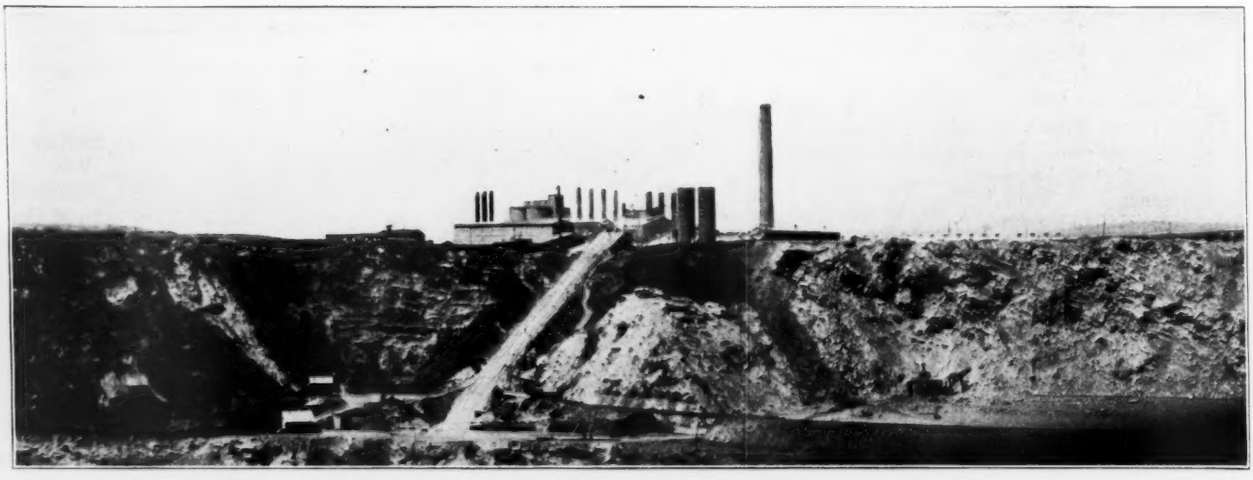
Elevator in plant No. 2 from crusher to dryer



Quarry incline to mill No. 2, showing locomotive, loaded car and empty car

These enviable conditions are the direct reflection of the attitude of W. R. Dunn, manufacturing director, toward his men. Naturally it is interesting to find out, if possible, just what Mr. Dunn does to win the loyalty of his personnel so effectively. That it is his personality is easy to see, but this personality is an elusive thing to set forth in writing, and about the only way to convey even an idea of it is to mention some of the policies and methods which he follows. Two men might follow exactly the same policies under similar conditions and the one with the wrong personality would fail, while the other, with the right personality, would meet with success. To be able somehow to show unqualified, simple and natural sincerity and to inspire complete confidence in it is the secret. And this does not mean being "easy," any more than being a popular and successful teacher means easy marks for the boys and girls who are preparing themselves to pass college-entrance examinations.

To use Mr. Dunn's words: "I never ask any of the men to do anything that I would not do myself." Having practically grown up in the business, he is personally able to operate any part of the plant, to repair machinery, and to design and construct additions. This he has not hesitated to do many times. Furthermore, it is part of his gospel to make a point of "treating everybody the way human beings deserve to be treated." Anybody



Incline from upper level of quarry to plant No. 3

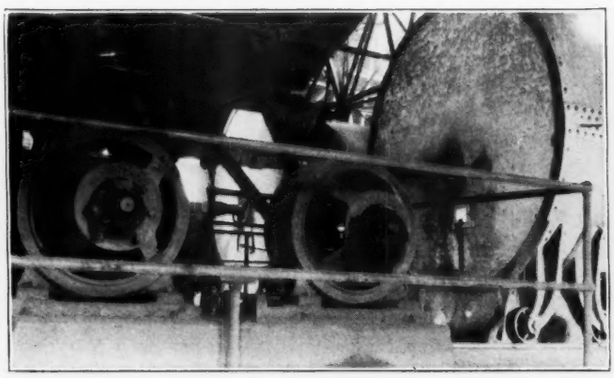
Loaded car traveling by gravity to foot of incline in quarry No. 2

who goes around the great plant with Mr. Dunn can see for himself on what excellent terms he is with everybody. There is no attitude of inferiority and superiority between the "big boss" and those under him but just the quiet, natural and simple attitude of men who have different degrees of responsibility and complete confidence in each other. His instructions are honored because everybody knows that he knows from experience what he is talking about, but it is well known that intelligent suggestions always receive unbiased consideration.

It is significant that the first thing Mr. Dunn began to talk about was safety. He related with great pride that there had been only one lost-time accident in the quarries in three years, and none at all for 28 months. In an operation of this size and character, that is an accomplishment of the first magnitude. Of course, the great thing is to "sell" the idea of safety to the men. This is done through the foremen, but here again it is a question of having the personality to do it. There are accident-prevention committees, naturally, made up of foremen and men who meet regularly; but Mr. Dunn does not attend the meetings because he feels that the men will talk more freely among

Machine for loading sacked cement into freight cars

themselves alone than if he were present. He places the responsibility directly up to them. Perhaps this gives some inkling of his personality, although it is not an unusual technique of successful management. It also goes without saying that a safety record such as this could not have been realized unless all the usual safety devices



Feed end of kilns, plant No. 3

Super cement finishing tube-mill

Tower-type coolers, showing end of conveyor beneath

and procedures had been installed and many more developed to suit the conditions obtaining here.

Last, but by no means least, it must be remembered that a good manager must not only have the confidence of those under him but also of the higher executives to whom he is responsible. That Mr. Dunn has been in full and unquestioned charge of manufacturing for years is a complete answer to this question.

The operations of the Vulcanite Portland Cement Company consist of three practically separate plants centering around one very large quarry, which can be extended to supply stone for many years to come. Plant No. 1 is the original cement plant, built in 1895. It now has equipment for making a special product called "Super Cement," used in making waterproof concrete. Plant No. 2 has a rated capacity of 800,000 bbl. per year and was constructed about thirty years ago. Plant No. 3, built in 1901, is the newest of the three and has a capacity of about 1,400,000 bbl. per year.

Quarry

The quarry is operated on two levels, the lower supplying Plant No. 2 and the upper Plant No. 3. The face at the upper level averages at the present time about 110 feet in height and that of the lower level about 50 feet. Three Loomis electrically-operated Clipper drills do the drilling. For blasting, the holes are charged as follows: the bottom quarter with 60 per cent Grasseli quarry gelatine, the next quarter with 25 to 40 per cent Dupont Red Cross, the third quarter with 25 to 30 per cent Red Cross, and the top quarter with stemming.

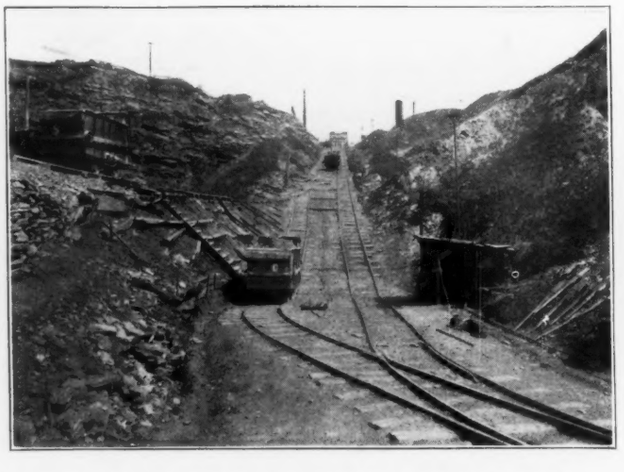
There are three Bucyrus steam shovels, and one Vulcan steam shovel in the pit for loading stone into quarry cars. One 70-ton Bucyrus shovel is stationed on each level with one 35-ton Vulcan shovel and one 40-ton Bucyrus shovel used as auxiliaries. One of the latter has been in service for 15 years and still gives satisfactory service as the result of a reasonable upkeep. These shovels load the stone into 6-ton Easton end-dump cars made especially for the Vulcanite company.

The lower level is kept dry by pumping with three motor-driven Cameron centrifugal pumps.

Separate inclines lead up to the two plants. The material for making Super Cement at Plant No. 1 is brought in from No. 2 Mill after the stone has been burned.

Plant No. 1

In this building grinding equipment has been installed for the production of Super Cement. It consists of a No. 8 Allis-Chalmers ball mill belted to a 50-hp. Westinghouse d.c. motor. This prepares the clinker for finished grinding in a No. 16 F. L. Smidth tube mill which is driven by a 250-hp. Sprague a.c. motor. However, before being ground in the ball mill, the clinker is mixed with a certain percentage of gypsum and another substance known as Catacoll made under English patents. The preparation and drying of the catalizer require



Empty car running by gravity to steam shovel in quarry No. 3

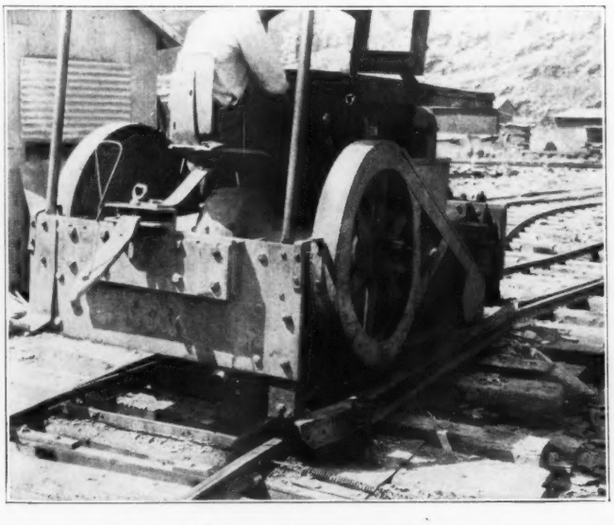
special equipment manufactured by W. F. Mosser & Son.

Plant No. 2

Quarry cars are hauled up the incline to this plant by a Treadwell electrically operated hoist but, at the bottom of the incline, they are switched and pulled back and forth to the working face by a Fordson tractor equipped with flanged wheels to travel on the tracks. At the bottom of the incline the tracks have been ingeniously arranged in the form of a triangle so that the loaded car may be uncoupled from the Fordson and travel by its own momentum along one side of the triangle to the point where the wire rope may be attached to it, meanwhile the engine passes across the base of the triangle to the intersection with the third side of the triangle where it picks up an empty car which has been sent down the incline. The switches are operated automatically, which saves labor and prevents accidents. This is made plain by reference to the diagram.

Quarry stone is dumped directly into a No. 10 Gates gyratory crusher driven by a 75-hp. motor from which it drops to a 30-in. belt conveyor having a Main Belting Company belt. This carries the stone to two No. 5 Gates gyratory crushers in parallel. It is next elevated to chutes leading to three 60-ft. rotary dryers, built by W. F. Mosser and Son, and originally kilns in Plant No. 1.

The dried stone is elevated by a Bartlett and Snow pan elevator to a belt conveyor discharging into a raw-stone bin of 3,600-tons capacity. Adjacent to this is the limestone storage bin holding about 1,200 tons. The limestone and cement stone are weighed on a Toledo scale and drop into a bin from which the mixture is drawn off onto a home-made belt conveyor and then elevated to bins over two Krupp ball mills. These break the stone down to ½-in. or less. For the final grinding the stone is elevated from the ball mills to a W. F. Mosser & Son screw conveyor leading to bins over the two



Locomotive throwing automatic switch

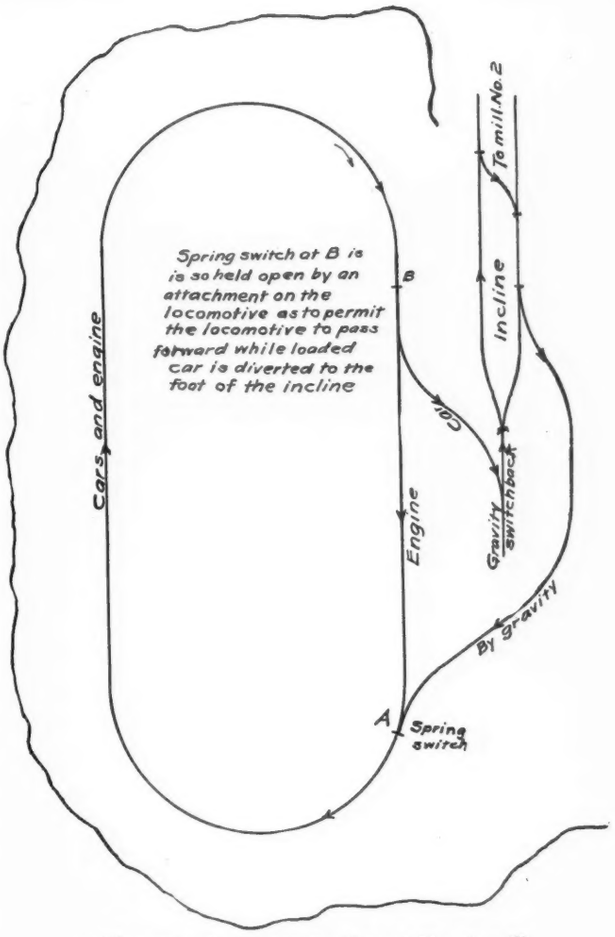
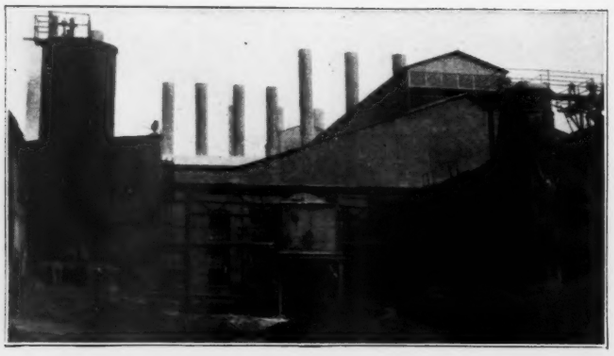

To mill No. 2
Incline
Spring switch at B is is so held open by an attachment on the locomotive as to permit the locomotive to pass forward while loaded car is diverted to the foot of the incline
B
Cars and engine
Coal
Engine
Gravity switchback
By gravity
A
Spring switch

Diagram of quarry tracks at No. 2 mill

Fuller Lehigh mills. It is then elevated and conveyed to six blending tanks, equipped with special rotating star feeders made by the Bethlehem Foundry and Machine Company, in order to produce a uniform mixture of limestone and cement stone. The blended mixture is then elevated and conveyed to the kiln feed bins.

There are three 125-ft. and three 60-ft. kilns. The 125-ft. kilns were made by the Vulcan Iron Works, the 60-ft. kilns, by W. F. Mosser and Son. These kilns operating in connection with three tower-type Mosser clinker coolers. The hot clinker is elevated to the top of these towers by means of Bartlett and Snow manganese-steel chain elevators installed one year ago and still in good condition, whereas formerly the old malleable iron chains were worn out after six months of service.

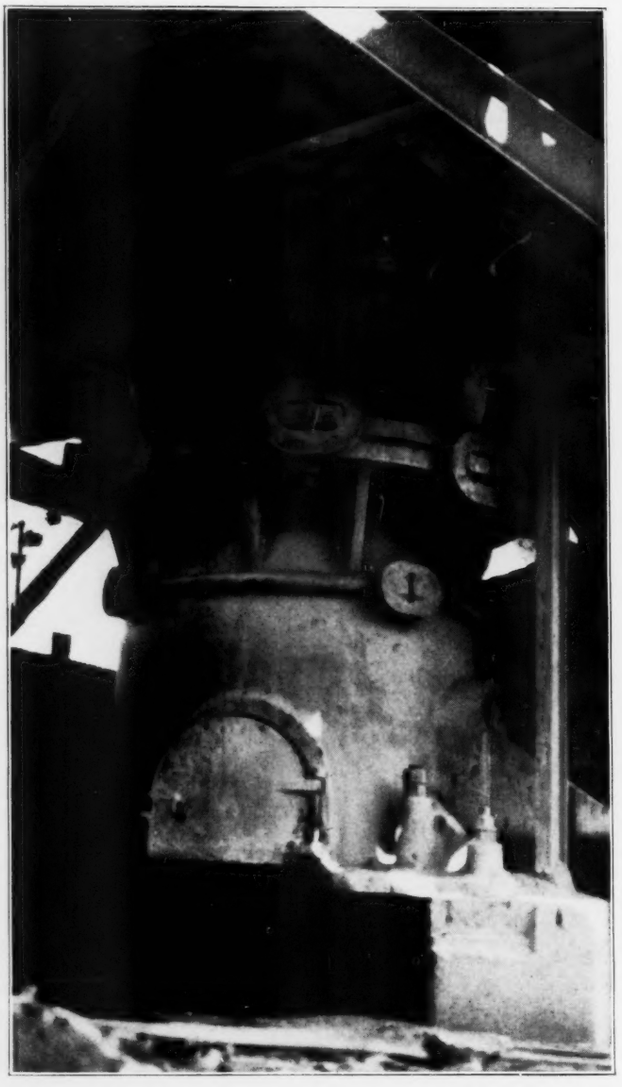
From the cooling towers the clinker is conveyed to two Mosser pot crushers where gypsum is added, and then elevated to a Bradley-Hercules mill and finished in an Allis-Chalmers tube mill, 30 ft. long and 7 ft. in diameter. From here the cement is conveyed to the cement storage house and then conveyed to the bins over the Bates packers. These, of course, are in the building adjacent to the railroad siding. This is provided with a belt freight-car loader for bags. There is one complete packing department at the Super Cement plant (Mill No. 1),



Coolers at right and left, showing clinker storage, plant No. 3

and two complete and independent packing departments at Mill No. 2.

The limestone is first crushed in a No. 5 Gates gyratory crusher. It is then elevated and conveyed through a W. F. Mosser and Son rotary dryer, and finally stored in large storage bins. Next it is mixed with its proper proportion of cement rock, conveyed to Krupp ball mills, and finally pulverized in Fuller-Lehigh mills. The pulverized mixture of limestone and cement rock is then stored in large blending bins as described above. It may be of interest to note that the limestone is high-grade and brought from the Lebanon district of Pennsylvania.



Primary gyratory crusher in plant No. 2

Cooled-clinker pan conveyor in plant No. 3

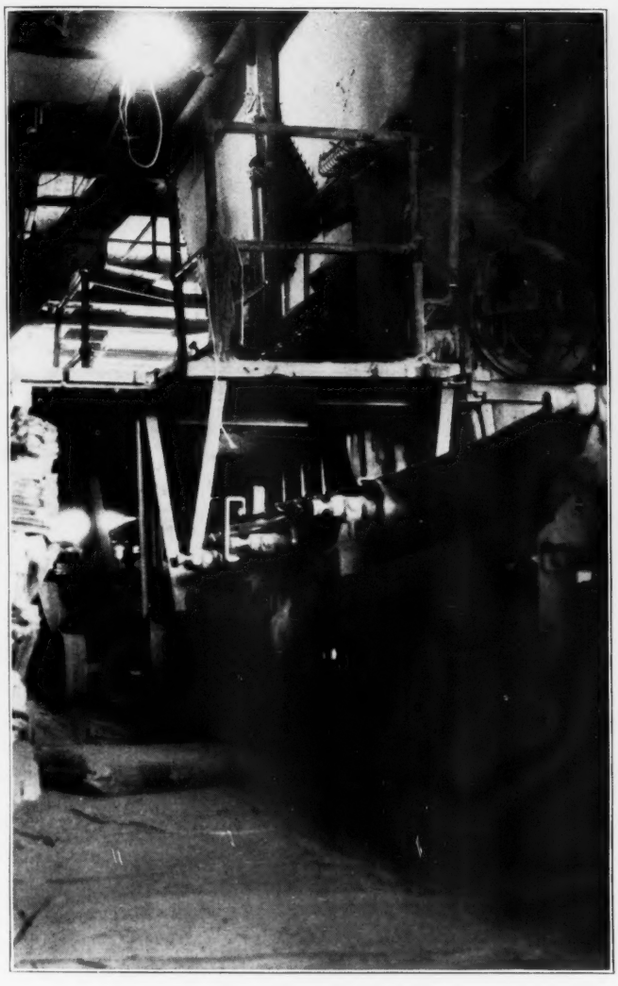
Plant No. 3

For plant No. 3 the quarry stone on the upper level of the quarry is brought by gravity from a

Two machines handling surplus clinker from storage

switching point near the base of the incline back to the bottom of the incline. It has been possible to work this out in a very satisfactory manner with real savings in labor and machinery. Cars are hauled up to the plant with a Flory steam hoist and Hazard rope.

Substantially the same equipment is used in this plant as at Plant No. 2 with the following exceptions: the primary crusher is an Allis-Chalmers roll crusher of the Fairmount type, and there are five 125-ft. Vulcan Iron Works kilns and four 60-ft W. F. Mosser & Son kilns.



Gypsum mixers, plant No. 3

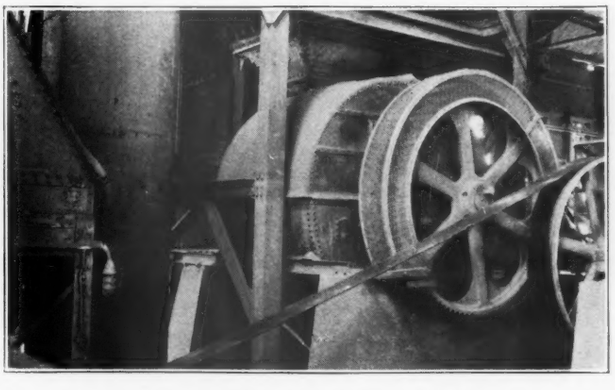
Coal Plant and Burning Equipment

Pulverized coal for the kilns is prepared in separate coal plants at Plants Nos. 2 and 3 which are similar. It is ground in Fuller-Lehigh mills and elevated and conveyed to the bins at the kiln houses. It is forced into the kilns by Sturtevant blowers. The burners are of special design developed and patented by Mr. Dunn and the waste gases are used in waste-heat boilers. The latter at Plant No. 2 was made by the Edge Moor Iron Works, and at Plant No. 3 by Babcock and Wilcox Company.

Clinker storage in plant No. 3

Packing and Shipping

There are in all seven independent packing departments—one located at mill No. 1, two located at mill No. 2, and four located at mill No. 3. Each packing department is served by a special railroad siding (in some cases by three sidings) so that the packing and shipping of cement is expeditiously handled. There is also provision made for the loading and trucking of cement at all of the packing departments mentioned above.

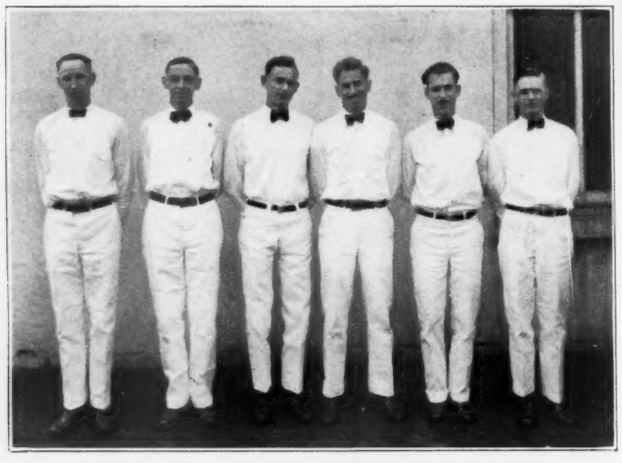


Super cement clinker reducing ball mill

Regional First-Aid Contest Between Cement Teams of Pacific Northwest

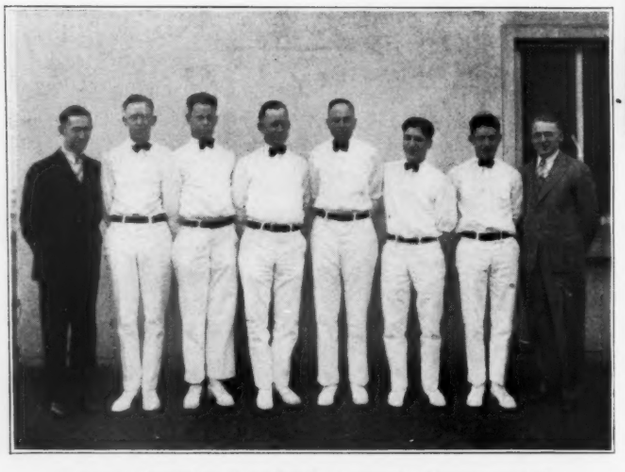
IN THE last issue—October 9—of PIT AND QUARRY we published an account of the meeting, September 18, in Portland, Oregon, of the Pacific Northwest cement manufacturers, and we mentioned the first-aid contest that was held in the afternoon.

Four first-aid teams were entered in this friendly contest which was conducted under the direction of officials of both the United States Bureau of Mines and the American Red Cross. Throughout our country as a whole, the former organization—the Bureau of Mines—has fostered and has given gratuitous training in this kind of work in the mineral industries, but, on the Pacific Coast, the American Red Cross has taken prominence in such work.

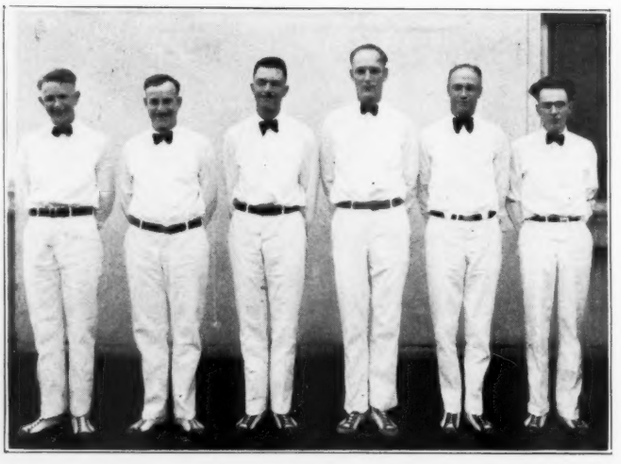


Winners, Oregon Portland Cement Company

The four teams that participated in this last contest represented Superior Portland Cement, Incorporated, of Concrete, Wash.; Olympic Portland Cement Company, of Bellingham, Wash.; Oregon Portland Cement Company, of Oswego, Ore.; and Oregon Portland Cement Company, of Lime, Ore.

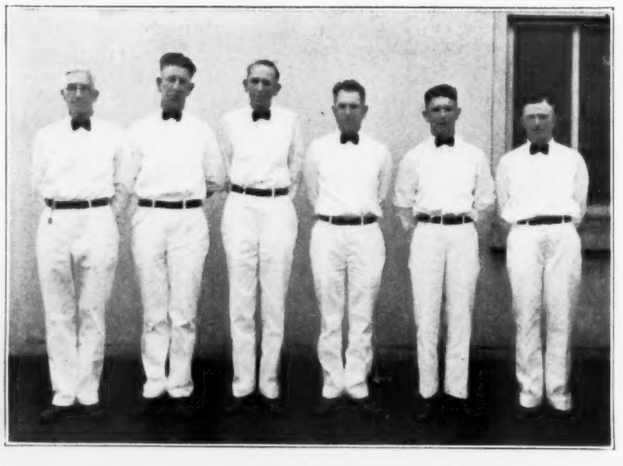


Team, Superior Portland Cement, Incorporated



Team, Oregon Portland Cement Company

According to the judges, the demonstrations were unusually good. Although the scores were close, the participants were well satisfied with the decision of the judges in awarding first place to the Oswego team. First prize was a bronze cup. The second award went to the Lime team.



Team, Olympic Portland Cement Company

This contest was followed, next day, by a forenoon of field sports and the dedicatory exercises and the unveiling of the 1928 no-accident trophy award to the Oswego plant of the Oregon Portland Cement Company. Taken together, the events of the two days were important to the safety officials and the employees at this plant. We are pleased to print group portraits of the four contesting teams.

Relation Between the Physical Properties of Fire-Resistant Building Materials and the Process of Manufacture

By DR. W. GROOTHOFF

[*The following article contains a very interesting and valuable discussion of the relation between the physical properties of fire-resistant brick and like building materials and the process of manufacture. Incidentally, these various manufacturing methods are described in their essential details and a number of valuable points are made regarding the proper conditions that must be observed in their operation. Particular attention is called to the tabulation which shows exactly how the manufacturing method is inter-related with the physical properties of the finished product. This article was delivered in the form of an address before the Annual Meeting of the German Society for Chemical Apparatus Research in Breslau, Germany. Trans.*]

THE manufacture of fire-resistant products is an industry which is founded on the confidence of its customers. For they have no opportunity of testing the suitability of the raw materials used, nor of making sure that the finished products actually possess the guaranteed properties. Special apparatus is required for this and the user of these products does not ordinarily possess such equipment. During the course of the past few years, extensive research has developed the fact that the lasting qualities of a fire-resistant building material is dependent in the first place upon its physical properties, and in the second place upon its resistance to high temperatures, its composition, and other factors. It is only within recent times that the industry has become clearly convinced that the attainment of certain physical properties in the finished product depends to a large degree on the manufacturing method employed, and that certain definite properties can be obtained by using certain definite manufacturing processes, and finally that when the finished products possess certain characteristic properties, the manufacturing method used can be deduced.

There is, however, no single process which will give the best results under all circumstances. Each process is best suited for a given purpose. The variety of uses to which fire-resistant products are put in modern industry makes it essential that the manufacturers of these products pay particular attention not only to selecting the best suited raw materials, but also to the manufacturing method which will yield the desired physical properties in the finished product. It is also essential that proper attention should be paid to the operating costs and to the cost of the raw materials used. Expensive raw materials should be used only when they are absolutely necessary.

Only a few principal types of manufacturing processes are described. Mention must be made of the fact that there are certain methods which are combination processes and do not belong wholly to one class or another. It is also impossible in this article to discuss all the possible combinations and variations of manufacturing methods which can and are being used in this industry.

The following tabulation gives the various processes, the machines required in their operation, the degree of disintegration of the clay and the character of the mass, whether plastic, etc.

Various Process for the Production of Fire-Resistant Structural Materials

	Machines Required	Disintegration of the clay	Character of the mass
A. BRICK PROCESS.	Brick press	Bad	Plastic
B. WET PROCESS.			
(a) Without dry preliminary mixing.			
1. Chamotte and clay worked up together.	Edge mill Brick press	Generally bad, capable of being improved by aging.	Plastic
2. Chamotte previously comminuted Clay in lumps	Chamotte, comminuting apparatus Edge mill Brick press	Bad and irregular	
3. Chamotte previously comminuted	Chamotte comminuting apparatus Screening apparatus	More regular, the thinner the clay is cut up	
Clay cut up	Clay planer Brick press		
(b) With dry preliminary mixing.			
4. Chamotte and clay worked up together.	Edge mill Mixer Brick press	Irregular	
5. Chamotte previously pulverized Clay ground up	Chamotte grinders Screening drums Clay driers Grinders Mixers	Average to good according to the degree of fineness	
C. DRY PRESSING PROCESS.	Edge mill Mixer Presses	Not disintegrated	Non-plastic
1. Chamotte and clay worked up together			
2. Chamotte previously pulverized Clay ground up	Chamotte grinders Screening drums Driers Grinders Mixers Presses	Not disintegrated	
D. POURING PROCESS.	Chamotte grinders Screening drums Mixers Stirring equipment	Very good	Pourable
E. S. and G. PROCESS	Chamotte grinders Screening equipment Weighing installation Clay driers Grinders Stirring equipment Mixers Presses Ramming equipment	Very good	Non-plastic

The brick process is the oldest of all and needs but little description here. The clay is mixed with

*Tonindustrie Zeitung, 1929, pages 866-869.

substances used for diminishing its plasticity and thoroughly worked up ready for forming. There is no difference in the general details of the process from the ordinary building brick process, except that fire-resistant clay is used as a raw material instead of ordinary brick clay.

The wet mixing process consists in working up together large quantities of substances, such as previously burnt clay, shale-chamotte, quartz and the like, used to diminish the plasticity of the clay, and fire-resistant clay with or without preliminary dry mixing. According to whether or not the clay and the chamotte are worked up together or separately, a greater or lesser number of machines are required for this process.

When the clay and the chamotte are worked up in the wet state, then an edge mill is most advantageously used, which both breaks up the plasticity-reducers and mixes them with the clay. The necessary water is added directly to the edge mill. The mixture is then ready for the brick press.

The aforementioned processes are truly primitive and give irregular results. Previously ground plasticity-reducers are used in order to attain a more regular mass. The screens used in this process are important for separating out the coarse particles and returning them to the grinders. The rest of the process is the same as above.

The preliminary operation of cutting up the clay into fine slices or the like has been adopted in the effort to increase the disintegration or colloiding of the clay so that masses of clay, which cannot be used for the manufacture of fire-resistant products by the previously described processes, are now so used. The finer the pieces into which the clay is cut up, the less work for the edge mill, and when the preliminary operation is properly carried, it is possible to do without the edge mill altogether. The brick press is then used for mixing the plasticity-reducers with the clay. The clay comminuter or planer replaces the costly edge mill operation.

The raw materials may also be processed by the dry mixing process, which is, of course, fundamentally different from the wet process. The dry clay and the chamotte may be pulverized together in the edge mill, which can be provided with automatic screening devices. The hard chamotte particles in the mixture promote the fine grinding of the softer clay particles. The mixture is then moistened with water and fed into the brick press.

It is best to use previously ground chamotte and finely pulverized clay in the wet process. This process is more expensive than the one described above but it gives better results.

The wet process yields a plastic mass of more or less uniformity, which often contains lumps of clay. Particularly when the process is carried out too rapidly, the irregularity of the mixture is marked, for the water is not given sufficient time to penetrate through the larger particles of clay and produce a mass of uniform consistency. It is possible to improve the mixture by allowing it to age, when it is allowed to remain for prolonged periods in the moist state in moist places. This causes the water to become uniformly distributed throughout the mass, which is of very great importance in the subsequent processing. It is often advisable to pass the aged material a second time through the mixer or a brick press, and when this is done a uniform mixture is obtained.

The dry pressing process operates in an entriely different manner. The clay is treated only in the comminuted or finely ground form without the addition of a large amount of water. There are, of course, many different ways in which this process may be carried out. When the clay and the

Manufacturing Methods and Properties of Fire-Resisting Materials

Process	Ratio of chamotte to clay	Water content of mass ready for forming	Shrinkage in dry state	Shrinkage in burning	How formed	Drying time s. small and l. large shapes	Keeping quality of mass and smoothness of surface	Structure	Porosity	Mechanical strength	Resistance to temperature change	Constancy of volume at operating temperature
Brick process	0:100 to 20:80	25%	8-10%	5-7%	press for wire cutting or by hand	s. 3-4 weeks l.	Very bad Uneven	Very irregular fissured	Very great	Good only on hard firing About 710-2150 lbs. per sq. in.	Bad 0-2 degrees cooling	Marked shrinkage
Wet kneading process	40:60 to 70:30	18-22%	3-6%	3-5%	By hand or with aid of simple press	s. 3-4 weeks l. 4-6 weeks	Varies much according to method of preparation Uniform	Very irregular; pipes due to clay lumps	Varies according to burning and raw material	Ditto About 710-4250 per sq. in.	Mostly bad according to preparation and density 0-10 degrees cooling	Shrinkage after burning
Dry pressing process	65:35 to 80:20	5-7%	0.5-1%	1-2%	Hydraulic press	s. 0 hours l.	Good Smooth surface friable edges	Irregular—defects in direction of pressing	Great Very great when particles are fine	Somewhat greater About 1420-4250 lbs. per sq. in.	Medium to very good 5-15 degrees cooling	Favorable
Pouring process	50:50 to 65:35	17-20%	3-4%	2.0-4%	gypsum moulds	s. 1-2 weeks l. 5-6 weeks	Much reduced	Air holes and pipes	Normal medium	About 1420-2840 lbs. per sq. in.	Bad to Medium 1-10 degrees cooling	Shrinkage after burning
S. and G. process	90:10 to 95:5	3-5%	0.0-0.1%	0-0.5%	Hydraulic press or with tamping presses	s. 0 hours l. 2-12 hours	Very good Smooth surface	Very good Pipes surely avoided	Very small controllable	Very high About 3550-14200 lbs. per sq. in.	Good to very good 10-20 degrees cooling	Favorable Very slight after shrinkage

chamotte are worked up together in an edge mill the clay is less finely ground than when it is treated by itself in a special grinder. The previously well mixed dry ingredients are moistened with only a small amount of water in the mixers and hence the mixture remains non-plastic. This crumbly mixture can be worked up only by means of high pressure in a hydraulic press. Up to the present time, only small dimensioned brick and the like have been manufactured by this process.

The pouring process makes use of the property of clay of being converted into a liquid mass with comparatively little water in the presence of electrolytes. If plasticity-reducers are simultaneously added to such a clay or directly thereafter, then a mass is obtained that can be poured. This mixture differs from those that are commonly obtained in the works in the fact that the clay is completely disintegrated. This process is used only for high grade products. The patents that originally protected this process have expired.

There is another process which also makes use of this property; that is of the clay becoming colloidal in the presence of electrolytes, but it is not concerned so much with making the mass pourable, but uses the liquid clay slip for only obtaining an extremely fine film of clay molecules over the individual particles of the chamotte. This is the S. and G. process. The finished mass is, therefore, neither plastic nor pourable. Its condition is just like that of the mass obtained in the dry pressing process and hence can be formed into shape only by the application of high pressure.

The important matters to consider in all these processes are the composition of the mixtures obtained and the moisture content and the shrinkage as they are controlled by the percentage of clay.

Thus the mixtures that are obtained according to the brick process contain 80 to 100 per cent of clay, while the water content of the mass, ready for shaping into form, is 25 per cent, the contraction in drying 8 to 10 per cent and the shrinkage on burning 5 to 7 per cent.

In the wet mixing or kneading process, larger proportions of substances, reducing the plasticity of the clay, are employed, so that the clay content varies approximately between 30 and 60 per cent, on the average 40 per cent. The water content of the mixture ready for forming is approximately 18 to 22 per cent, while the shrinkage on drying is 3 to 6 per cent and that on burning 3 to 6 per cent.

The properties of the mixture are quite similar in the pouring process. The proportion of clay in the mixture varies between 30 and 50 per cent approximately, the water content between 17 and 20 per cent, the shrinkage on drying 3 to 4 per cent, and that on burning 2 to 4 per cent.

On the other hand, the properties of the mixture are different in the dry pressing process. Here, the mixtures are prepared with the addition of large amounts of plasticity-reducing substances and with smaller amounts of clay. The clay is moistened only slightly, so that the water content of the mixture ready for forming is only 5 to 7 per cent, and hence the shrinkage on drying is also correspondingly small. It amounts to from .5 to 1 per cent. The shrinkage on burning is also smaller and amounts to 1 to 2 per cent. This is due to the smaller clay content of the mixture.

Finally, in the S. and G. process, where the clay is made colloidal by means of electrolytes and the product is used in small amounts only to form a skin over the particles of clay in the mixture, approximately five to ten per cent of the colloidal clay slip is used. The mixture, which is ready for forming, contains from 3 to 5 per cent of water and the small amount of water makes the shrinkage on drying minimum, that is, from zero to 0.1 per cent, while the shrinkage on burning is also extremely small from zero to 0.5 per cent.

It may, therefore, be held that the last two processes are exceptional due to the small amount of water in the mixture and the very low shrinkage. On the other hand, the wet kneading process and the pouring process are similar in that the mixtures contain a large proportion of water and the shrinkage is high.

A few words may be said regarding the forming of the various mixtures and the structural characteristics and keeping quality of the products.

Standard forms, potters' plates, simple pipes and tubes and other small shapes are manufactured by the brick pressing process. The character of the mixture is too irregular to permit larger and more complicated shapes to be made by this process. The high content of clay makes it difficult to obtain products that will keep well. The surfaces are uneven. The structure of the product is often filled with fissures and cracks, just like in the manufacture of brick. Faulty shapes are also common.

Considerably better mixtures are obtained in the wet kneading or mixing process. All sorts of shaped brick and stone can be prepared by this process. The mixture is worked up mostly by the hand-shaping method. Simple forms can, however, also be manufactured by means of machines of various types. The drying time for small products is one to two weeks; on the other hand, it is from four to six weeks for larger shapes. The keeping quality and the structural characteristics of the products vary very considerably, and depend essentially on the manner in which the mixture was originally prepared. Strains are produced in the products due to the rather great shrinkage on drying with the result that holes and pipes are formed within the mass. It has been determined that the pressure exerted by the shrinkage forces within such masses during the drying process is as high as 700 millimeters of mercury and more. Holes are also formed within the mass when the

mixture has not been thoroughly incorporated, due to the great shrinkage of the clay lumps on burning.

Hydraulic presses only are used in the dry pressing process. No time need be spent in drying the product, which possesses good keeping qualities and smooth surfaces. Irregularities in the structure and shape of the products in the direction of pressing are aften encountered with most raw materials. According to the experience of the writer, this process is not suitable for making large, complicated shapes.

The method of working is entirely different in the pouring process. Gypsum molds are used into which the fluid mass is poured. The great shrinkage causes considerable contraction of the shape of the article. In order to obtain smooth surfaces, large shapes must be smoothed before burning. The time required for drying is the same as in the wet mixing process. Air holes and pipes cannot be definitely prevented.

The S. and G. process is carried out similarly to the dry pressing process with the aid of hydraulic presses. This process allows the production of large complicated shapes. Retention of shape is very good, due to the almost complete elimination of shrinkage. Absolutely level surfaces are thus obtained even in large pieces. Time need not be spent in drying the small shapes and only a few hours are required for the large shapes.

The physical properties of the various products must now be considered. The first important property is porosity. Greatest porosity in the product is obtained by the brick pressing method and also by the dry pressing process. The porosity is very great with fine particles. Normal porosity is obtained in the wet kneading and the pouring processes. In this instance the porosity depends considerably on the method of burning and on the raw material used. The higher the quality of the raw material, the greater the porosity for the most part. Conditions are altogether different in the S. and G. process, which permits greater control of the porosity. It is therefore possible to manufacture products by this method which have only a small porosity.

The mechanical strength of the product is also different according to the process of manufacture. In the brick pressing and the wet kneading methods, the strength in compression depends particularly on the burning. The harder burnt the stone, the higher the strength in compression. The strength in compression varies between 50 and approximately 150 kilograms per square centimeter (from 700 to 2150 pounds per square inch). The dry pressing process allows somewhat higher compression strengths, although in this case as well the size of the particles, the method of preparation, and the nature of burning, exert great influence on the results obtained. The products, which are obtained according to the pouring process possess moderate strength in compression, which varies between 100 and 200 kilograms per square centimeter (from 150 to 300 pounds per square inch). The products which are made in accordance with the S. and G. process possess considerably higher strength in compression, which can amount to from 250 to over 1,000 kilograms per square centimeter according to the use to which the products are going to be put.

The resistance to change in temperature possessed by the products, which are manufactured according to the brick pressing and dry kneading process, is mostly bad. It is considerably dependent on the method of manufacture and on the porosity of the product. Products with lower porosity show bad resistance to temperature change. On the other hand, highly porous products, particularly when they are made according to the process which involves dry mixing of the ground clay and pulverized chamotte, are better able to resist temperature change. The dry pressing process has a favorable effect on the resistance to temperature change. It is also possible to figure that the products will resist a 5 to 15 per cent drop in temperature, which must be considered very good. The pouring process is similar to the wet kneading process in this connection and the products resist only a small change in temperature.

The last process, namely the S. and G. process, differs very markedly from the others as far as resistance of temperature change in its products is concerned. In this case the resistance of temperature change is no longer principally dependent on the density of the stone and the burning, but can be raised to quite a high point through the adaptability of the process in spite of the density of the stone. It has been found that such products can resist as much as 50 to 90 degrees temperature drop without injury.

As far as the constancy of volume at operating temperature is concerned, it is not possible to prevent in its entirety the shrinkage that takes place in the stone when it contains a high percentage of clay. Attempts have often been made to eliminate this condition by the addition of quartz at the expense of the structural characteristics of the product. The dry pressing process and the S. and G. process are advantageous in this connection.

The information that has been given above on the relation between the physical characteristics of the product and the manufacturing method used may yield the conclusion that it is often most advisable to buy the most expensive and best product available, so that all the difficulties are circumvented and best use is obtained from the product. Such products will avoid frequent shut-down of the apparatus in which they are used and make for all-around economy.

Michigan Pressed Brick Company of Detroit Operates Modern Sand-Lime Brick Plant

A Good Example of a Modern Plant for Converting Excess Sand Into a Desirable Building Material

By W. E. TRAUFFER

THE SAND-lime brick plant of the Michigan Pressed Brick Company at Detroit, Michigan, is a good example of the modern type of operation. Its location at 4500 N. Lawton Street is in the center of a busy industrial district along the Michigan Central railroad.

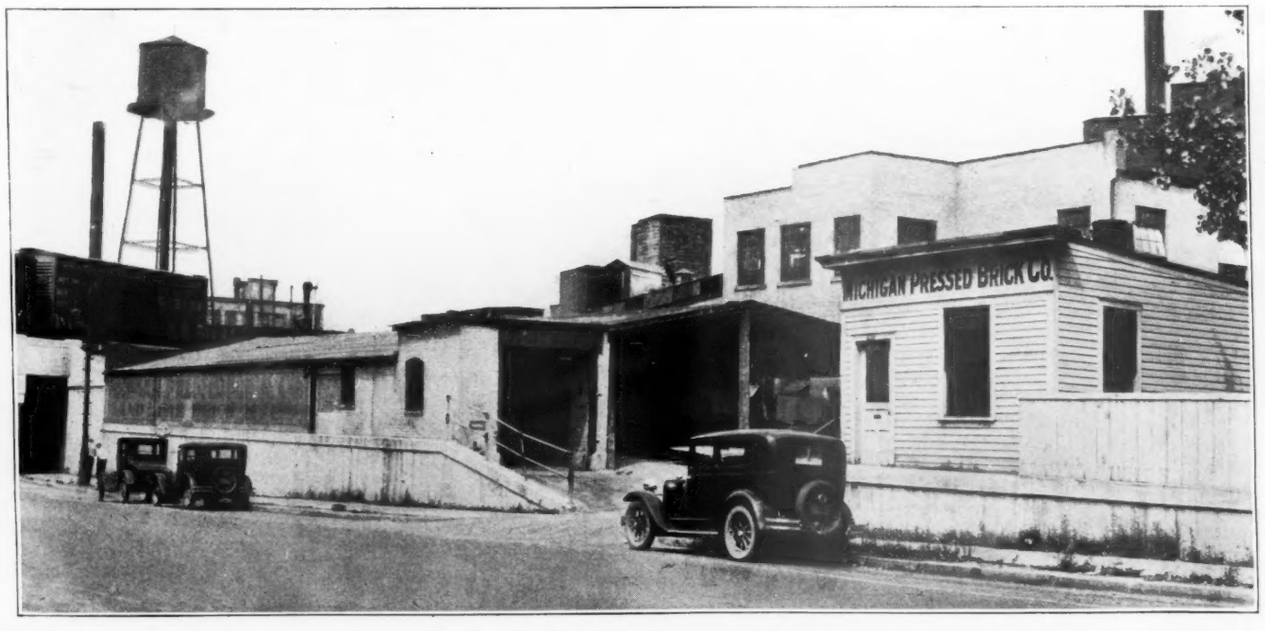
The plant was first built in 1902 and was almost entirely rebuilt in 1924 with more than double its previous capacity. The buildings are all of sand lime brick except some of the storage sheds which are of timber. All floors and foundations are of concrete and structural steel framework is used in the superstructure of some of the newer buildings.

Sand Pit and Storage

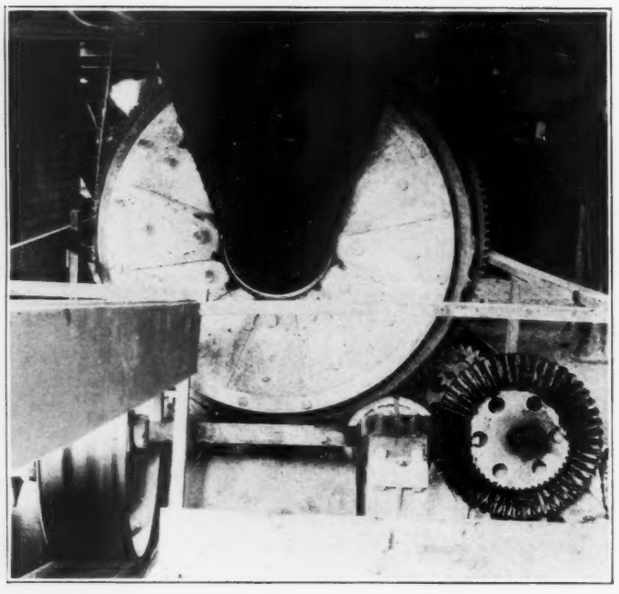
The pit from which the sand is secured is 5 miles north of Rochester and about 25 miles north of Detroit. A Browning locomotive crane with a ¾-yd. Hayward clamshell bucket loads into railroad cars which are hauled over the Michigan Central railway to the plant in Detroit. Sand is available much closer to the city but it is not suitable for brick making.

The sand is unloaded at the plant by a Pawling and Harnischfeger gasoline crawler crane equipped with a ½-yd. Lakewood bucket. This unloads into a stockpile or into wooden hoppers on top of the storage building. Timbers underlying the stockpile give a smooth surface which allows rehandling to be done easily and cleanly. One of these hoppers feeds directly onto an inclined belt conveyor which in turn discharges onto a Chain Belt Company movable storage conveyor which has one end free allowing loading anywhere in the storage building. This conveyor is driven by a small self-con-

Crane moving sand from cars to stockpiles



View of plant and office from street



Rod grinding mill for sand and lime before going to brick machine

tained motor. The inclined conveyor is belt and gear driven by a 5 hp. Century motor. A wood enclosed bucket elevator recovers the sand from this storage into the steel sand hopper over the Jackson and Church volumeter. A chute from this bin also allows loading of the sand into trucks when desired.

The second bin loads directly onto an inclined belt conveyor feeding a 3-by-12-ft. Jackson and Church revolving screen with 1-in. perforations. The conveyor is driven at its head pulley by a small Century motor and the screen is chain driven by the same motor. The sand passing through the screen goes to the steel hopper over the volumeter, which was previously mentioned.

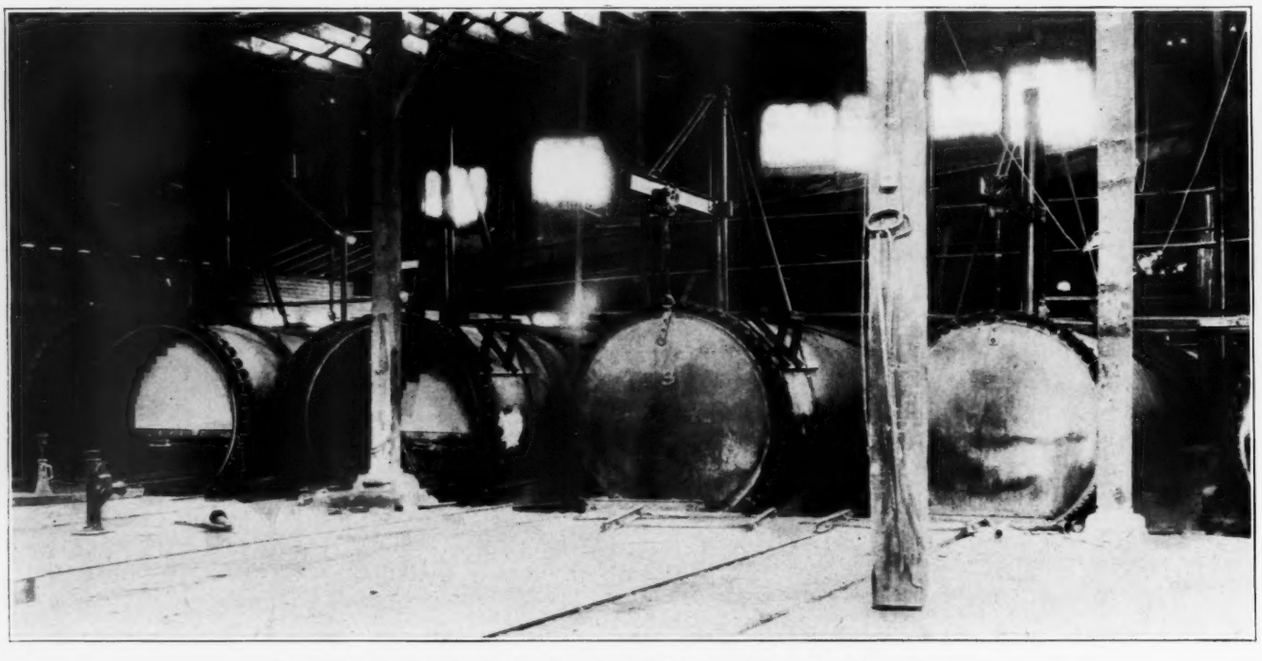
Lime Treatment

Lime is shipped in from Louisville, Kentucky, in bulk. It is unloaded at the plant with shovels and wheelbarrows which dump into a steel enclosed bucket elevator which discharges into a Jackson and Church hydrator at the top of the lime building. The elevator is driven at its head by a 5-hp. motor. The hydrator discharges by means of a special feeder into a series of two screw conveyors, the latter discharging through holes in the concrete floor into bins below. Sliding gates in the bottom of the conveyor housing regulate the flow into the various bins. Both conveyors are belt and gear driven, the first by an 8-hp. and the second by a 3-hp. motor.

From the bins, which are in reality concrete rooms with only one door, the lime is shoveled into another screw conveyor in a trough in the concrete floor. This discharges into a steel enclosed bucket elevator, both being belt and gear driven from the same motor. The elevator discharges onto a 14-in. 100-ft. centers inclined belt conveyor which carries the lime to a steel hopper over the volumeter adjacent to the sand hopper previously described. The lime bin, however, has a beater operated by a small electric motor through a Foote speed reducer for keeping the lime from sticking.

Both hoppers discharge onto the volumeter which consists of two belt conveyors, one for sand and one for lime. These run together and discharge the materials, in the proportions desired, into the grinding mill. The feeder is driven by a 4-hp. Westinghouse motor through chain and a Foote spur gear speed reducer.

The Jackson and Church rod mill pulverizes and mixes the sand and lime. The required amount of

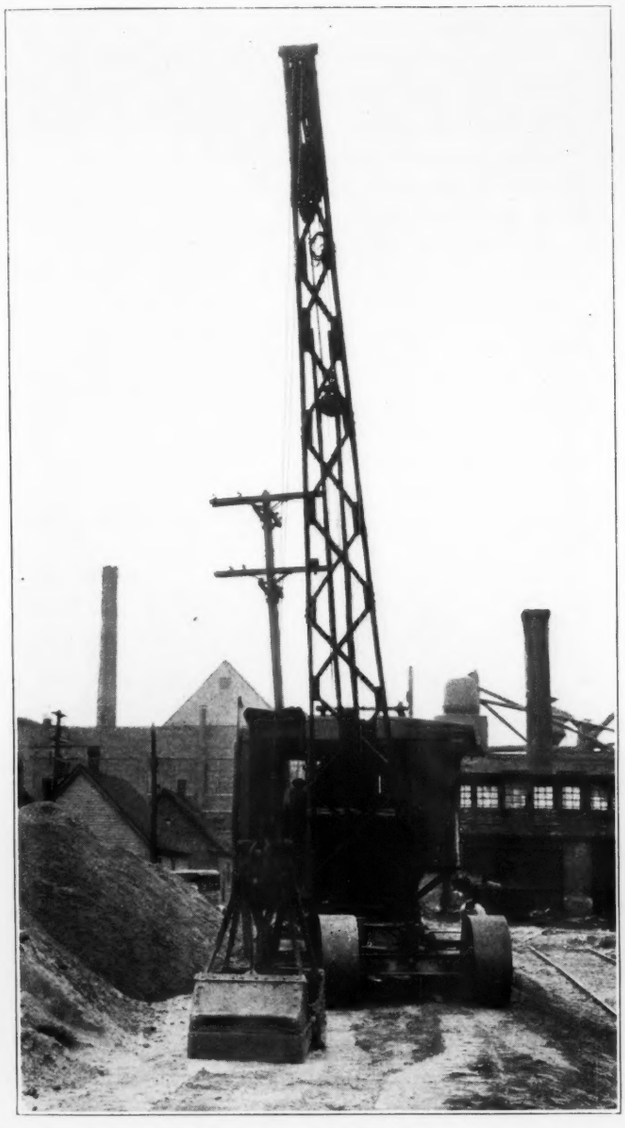


Two kilns being charged. The three kilns at right are being steamed.

water is also added. The mill discharges into a steel enclosed bucket elevator feeding to a short inclined belt conveyor with a Dings magnetic head pulley which removes any possible metal. The conveyor discharges through a spilt chute into bins over the two brick machines.

Brick Making

Both of the brick presses were furnished by Jackson and Church. One was installed in 1908 and is still in good running condition. The other was added in 1924 when the plant was enlarged.



Crawler crane for handling sand

The brick is loaded by hand from the presses onto steel cars and run on narrow gauge track directly into the hardening cylinders.

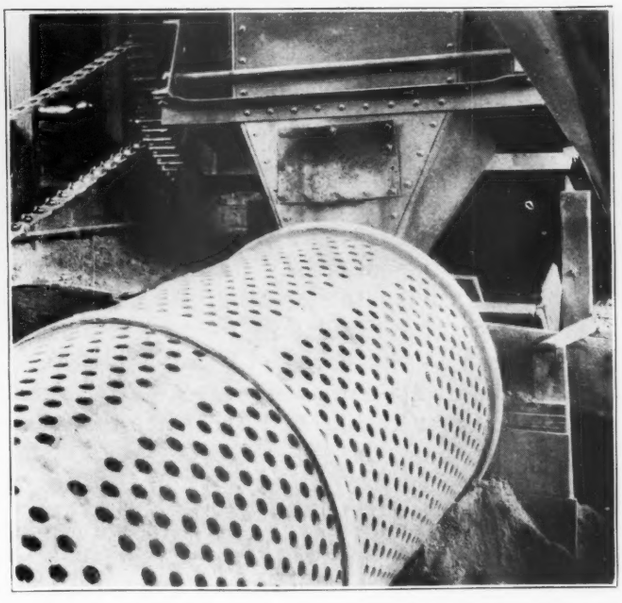
Two of these kilns which were furnished by the American Clay Machinery Company are 6-ft. in diameter by 60-ft. long and have been in operation since the plant was built. Two Jackson and Church 6½-by-56-ft. kilns were installed when the plant was enlarged in 1924 and a third similar kiln was

Pressure-lubricating a truck

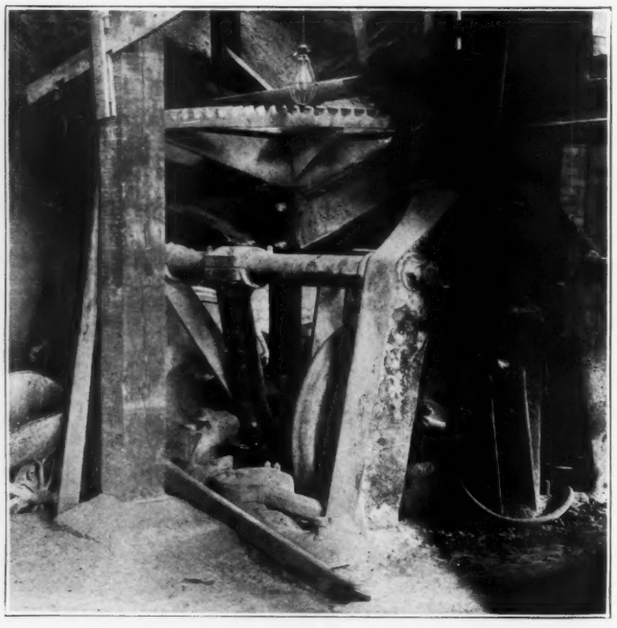
installed last spring. The total capacity of the kilns is about 86,000 brick which is also the plant capacity for a day. The brick is kept for 12 hours under 120-lb. steam pressure. The cars are then wheeled out and the brick loaded either into storage piles or directly onto trucks for shipment. There is covered storage space for over one million brick.

Brickbats

Brickbats, or brick, which are otherwise unsatisfactory are loaded into a Jackson and Church wet pan grinder which crushes them to powder. This discharges into an elevator and to a chute feeding the older of the two brick machines. It can also



Discharge from sand conveyor into revolving screen



Wet pan for grinding old bricks

be diverted onto a short horizontal belt conveyor feeding to a small wood hopper over the mill feeder. The brickbat dust, which is always dry, is added to the mix when the sand is frozen or extremely wet.

Coal

Coal is unloaded from cars, by the same crane which handles the sand, into wooden bins. The coal is used to fire two Atlas Engine Works return tubular boilers equipped with Kokal stokers. Each has 25 sq. ft. of grate surface, 1050 sq. ft. of heating surface and furnish steam at 120 lb. pressure for the brick kilns. A 15-by-20-in. 100-hp. Atlas steam engine which formerly ran the entire plant and which is now kept in reserve for an emergency may also be driven from these boilers.

Miscellaneous

All deliveries are made by company owned trucks which include 3 White 5 ton, a Packard 5 ton, and an Autocar 3 ton. Most deliveries are made locally but regular shipments are made as far as 65 miles to Pontiac, Monroe, Ypsilanti, Toledo, and numerous other nearby towns and cities.

The brick is used mostly for basement linings and for backing up walls. Its use for facing in large buildings is also increasing. Tests have given very satisfactory results. A recent test made by the Bureau of Standards at Washington, D. C., under standard specifications C21-20 of the American Society for Testing Materials gave the following results:

Modulus of rupture	671 lb. per sq. in.
Breaking load	1366 lb. per sq. in.
Compressive strength	2693 lb. per sq. in.
Absorption of moisture	15.3 per cent

Most of the plant machinery was furnished by Jackson and Church, including all belt and screw conveyors, bucket elevators, revolving screen, volumeter, rod mill, bins, brick presses, wet pan, cars, car cleaners, hardening cylinders and other pieces of equipment. Conveyor belting is mostly Gutta Percha and Rubber Manufacturing Company "Saturn" belting and Century electric motors are used almost exclusively.

The office is in a small building near the plant. Officers are: Frank W. Hubbard, president; F. Langdon Hubbard, secretary and treasurer; and Geo. N. Roller is superintendent.

Local Council Representatives on Executive Committee

The following are local council representatives on the Executive Committee of the National Safety Council for the ensuing year:

Charles E. Redfern, Executive Vice President, Providence Safety Council Claims Attorney, United Electric Railways Co., Providence, R. I.

Ancil D. Brown, Past President Syracuse Safety Council, Claims Attorney, New York State Railways, Syracuse, N. Y.

H. O. Allison, Safety Director, Pittsburgh Railway Co., Pittsburgh, Pa., Member Board of Control, Western Pennsylvania Safety Council.

Norman Anderson, Vice President, Cleveland Safety Council, Secretary, Employees' Benefit Committee, Ohio Bell Telephone Company, Cleveland, Ohio.

Paul Van Cleef, Chairman Board of Directors, Chicago Safety Council, Van Cleef Brothers, Chicago, Ill.

T. G. Brabston, Past President, Birmingham Safety Council, Superintendent of Transportation, Birmingham Electric Co., Birmingham, Ala.

T. J. Strickler, President Kansas City Safety Council, Vice President, Kansas City Gas Co., Kansas City, Mo.

Officers of the National Safety Council for the Coming Year

The new executive committee met Wednesday evening, October 2 and elected the following officers for the current year:

President, C. E. Pettibone, American Mutual Liability Ins. Co., Boston.

Vice-president Industrial Safety, C. L. Close, U. S. Steel Corp., New York.

Vice-president Public Relations, C. E. Hill, New York Central Lines, New York.

Vice-president Public Safety, Miller McClintock, Harvard University, Cambridge, Mass.

Vice-president Territorial Councils, George Opp, Detroit Edison Co., Detroit.

Vice-president Finance, C. W. Bergquist, Western Electric Co., Chicago.

Vice-president Engineering, Earl F. Blank, Jones & Laughlin, Pittsburgh.

Vice-president Membership, G. T. Hellmuth, Chicago, North Shore & Milwaukee R. R. Co.

Vice-president Education, A. W. Whitney, National Bureau of Casualty & Surety Underwriters, New York.

Vice-president Health, Dr. C. E.-A. Winslow, Yale University, New Haven, Conn.

Treasurer, J. I. Banash, Fonda Tolsted Co., Chicago.

Managing Director, W. H. Cameron, National Safety Council, Chicago.

First Aid in the Limestone Industry

By DR. E. M. PARLETT *

ONE of the most striking characteristics of the history of the last decade is the great progress made by science and the notable changes effected by this progress on social and industrial life. A sphere of human activity in particular in which the change is especially noticeable is the practice of applied medicine and surgery to Industry, and another is the astonishing development and triumphant march of organized accident prevention during this period.

It was inevitable that these two correlated branches of applied science should meet on common ground to satisfy the demand of human reason and human needs. As civilization develops, life becomes more and more complex, and as such its needs multiply, and the application of science to meet these needs extends accordingly.

Today, a definite demand of modern Industry is possibly not so much that we should have more physicians and more surgeons; but that we have facilities and specifically trained and intelligent laymen as surgical accessories or adjuncts at hand and ready to meet grave emergencies that arise from time to time, and that result in serious physical injury to the worker. This demand and this need is characterized by the term "First Aid."

First Aid in response to this recognized demand of industrial progress has become the hand-maiden of accident prevention to such degree that today these two spheres of activity have become mutually interdependent. When men have become trained in First Aid principles and practice, the ability to successfully attend the injured in emergency is not the only benefit resulting; such employees become the high priests of accident prevention; the intelligent champions of Safety First principles. Such training has had much to do with the education of industrial forces generally in forming safe habits in those plants where this training has become an integral and thoroughly organized department thereof. It represents a splendid contribution and ally to the cooperative accident prevention program between management and forces, a strengthening of the bonds that unite the employer and employee.

The competitive First Aid demonstrations and stretcher drills, when held publicly, serve as an additional safety educational factor, not only to the entire force of employees who witness them but to their immediate families and the local community as well.

The periodical changing of First Aid teams personnel throughout the year further augments the intrinsic and broader values of the training given, promotes a certain solidarity throughout the organization, contributes measurably to plant morale, initiates definite and substantial economies in the cost of accidents, of compensation payments, of litigation and of surgical redressings, but furthermore reduces the chances of the loss of life, of infection and other untoward sequels of injury. Not the least important in the list of its values, First Aid represents to all and to the utmost that loftiest of human ideals, that Labor of Love, the conservation of human life, of human strength, of human energy, of human efficiency and productivity, and increases human happiness by preserving and prolonging life.

Acknowledging, then, that the inherent hazards of Industry have made the preparation for and the practice of First Aid treatment a cardinal necessity, we are therefore not surprised to find that minimum requirements covering this necessity have been prescribed and embodied in practically all State Department Safety Codes, and more specifically as applying to our immediate interests, the following, "Regulations for Pits and Quarries" and "Regulations for Mines Other Than Coal Mines"—promulgated by the Commonwealth of Pennsylvania, Department of Labor and Industry.

In discussing First Aid treatment and facilities, I have chosen to confine my remarks to limestone mines and quarries employing from 100 to 500 men. In this Industry as a whole the fatalities number one to approximately every 102 accidents, the fatality rate being 1.79 per thousand 300 day workers. The accident rate being 183.52 per thousand three hundred day workers. (Bureau of Mines of U. S.)

Now, may we ask what is meant or comprised by the term First Aid? We may perhaps best express or define First Aid treatment in its most significant sense as that which covers only that immediate and urgent treatment where the individual's life is jeopardized, except perhaps and in its broadest but less important sense, to include that treatment which is rendered to very minor injuries and subsequent redressing thereof; those usually not requiring the immediate or constant attention of a surgeon.

The scope of First Aid treatment is limited and should not be misconstrued to take the place of the surgeon, but only until such times as the surgeon arrives. In all cases of grave injury, the surgeon

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is called as one of the immediate duties of the First Aid attendant. Likewise, the emergency room is to be considered only as a clearing station in such emergency before sending the patient, accompanied by the surgeon and the attendant (if deemed necessary), to the general hospital or to his home.

May I say parenthetically that the surgeon should preferably be one versed in that highly specialized branch of surgery known as Industrial Surgery, having as a predominant feature, not generally embraced by ordinary surgery, namely, rehabilitation of the injured, which follows a skilled operative procedure in the more definite avoidance of disfigurement and permanent disability, by restoration of defective function as near the normal as possible, involving a judicious knowledge and application in suitable cases of bone-plating, diatheramy, mechanical functional restorative apparatus, skin grafting, occupational therapy, etc.

Someone has said that First Aid ceases when either the surgeon or the ambulance arrives. Had the author of that statement omitted to infer or define the ambulance as the equivalent of the surgeon in the circumstances, his statement would have gone unchallenged.

Let it be impressed that, in other than rare instances, those patients suffering grave injury are better off, the earlier the surgeon arrives and (within reasonable limits) the later the ambulance departs from the plant hospital with the patient. We should never attempt to transport a patient long distances when suffering profound shock or collapse. This condition demands prompt and adequate measures which sometimes require a relatively prolonged period. We must remember that life is dependent upon the fine adjustment of the functional relation of many interdependent actions in the body; the heart action, circulatory tone, the respiratory rate of nerve impulse and response, of metabolism, digestion, and elimination. Accident abruptly causes maladjustment and depression of these vital functional relations, which is characterized as shock or collapse. It is difficult or impossible to adequately assist nature to restore this delicate balance caused by profound shock in transport by ambulance. Again, suppose it may be necessary to administer artificial respiration, which takes skilled effort and time. It is difficult to administer the prone pressure method in an ambulance. Before a patient may be safely moved to a general hospital or to his home, it may perhaps be necessary or expedient to apply sterile dressings to extensive or multiple lacerations, burns, abrasions, or in other cases, the fixation of splints (for today "we splint 'em where they lie"). Such important functions must, in the interests of the patient, be promptly and thoroughly performed before we may undertake to transport him. It all depends upon the nature and gravity of the injury and the patient's response to treatment as to how soon following the injury we may safely transport the patient. To do otherwise is ill advised and detrimental to the patient's best interests. The life of the injured is often at the mercy of him who first renders assistance. First Aid and sometimes surgical procedure and technique differ, even under what might, at first blush, be considered relatively identical conditions and circumstances. We should adopt those methods that the surroundings and equipment will permit, in the light of the nature and gravity of the injury, the patient's physical condition, his home surroundings, the distance from his home or general hospital, the equipment at the emergency hospital and the wishes of the patient or his family.

The attempt should not be made to teach too much to First Aid Classes. It is a mistake, in the writer's opinion, to attempt an elaborate system of training in an effort, if you please, to make would-be doctors of First Aid attendants. The field is too broad, too confusing and too technical. When such attempts are made, too often the attendant places entirely too much reliance upon his own restricted knowledge and resourcefulness and is thus apt to do untold harm to the victim. These teams should comprise men from different sections of the plant and those having an adaptation for this training. The essentials of First Aid training should be taught by the Company Surgeon and should cover the following:

1. Controlling hemorrhage.
2. Treating shock.
3. Artificial respiration for asphyxia from gassing, electric shock, drowning.
4. Treating heat stroke and heat exhaustion.
5. Treating chemical burns of the eye.
6. Applying sterile dressings and splints and bandaging.
7. Transportation of the injured by personal carry,—stretcher and ambulance.
8. A general knowledge of fractures and dislocations is advisable. However, such attendants should never attempt to set fractures, or reduce dislocations. There is no objection to the application of a Thomas splint to the leg or arm. They should not attempt to remove imbedded foreign bodies from the eye.

They should be instructed in the significance of unconsciousness, differentiating if possible the unconsciousness due to brain concussion, fainting, heat stroke and heat exhaustion, apoplexy, drug poisons, gas, alcohol, epilepsy, etc., and judiciously apply the correct application of First Aid knowledge to meet the particular situation.

Trained First Aid attendants should always carry a pocket emergency First Aid Kit, containing compress, bandages, iodine or mercurochrome, adhesive, safety pins, sterile gauze and ammonia ampule, for initial dressing in immediate emergency.

It is better not to permit medicine intended for internal use to be kept in any First Aid Cabinet, other than in the plant hospital; and to restrict their administration to the physicians's orders. There is ever an inclination to a too promiscuous use of such drugs when they are placed where the rank and file of employees may get to them. There is danger that the wrong drug or an over-dose may be taken.

Every injury, no matter how slight, should receive prompt treatment and every such injury should be reported and recorded as a matter of strict policy, firstly because to do so is in the interests of the patient, and secondly because, if a record of every accident is regularly made, the absence thereof of such records may be set up as one means of defense against fraudulent claims by employee injured out of employment.

In order that First Aid treatment may develop its maximum value in plants of varying size, description and location, and especially in plants of large area where workings are remote from the plant emergency hospital and where there is apt from time to time to be the necessity for immediate and grave First Aid treatment, it is desirable to equip the plant with First Aid Cabinets and Dressing Stations including stretcher and blankets and splints and place them in accessible locations to the majority of workers, and in some instances provide portable equipment that can be carried to awkward or isolated places where serious accidents occur.

Obviously, where the operations are limited in extent and the number of employees very few, the need of dressing stations is relatively decreased. The size of the plant and the number of men employed, together with the plant hospital, location as to distance from the working face, the size and equipment of the plant hospital are to be considered the determining factors as to the number and location of such first aid dressing stations. No definite or arbitrary rule can very well be laid down, other than the minimum requirements as promulgated by Code. However, it is often necessary and profitable to make such service more expansive and adequate to meet the usual, or unusual requirements, than to limit the equipment and the number of trained attendants to the minimum requirements. The writer does not assume to offer any set of rules that may be deemed as standard. However, it is his opinion that three first aid teams of five men each and three first aid dressing stations should be adequate for every 100 to 150 men employed.

It is frequently a matter of grave concern to Industry as to how much it can afford to spend for First Aid equipment and training to obtain the maximum results, or what those adequate requirements comprise. Accident experience, area, remoteness of workings, etc., may assist in arriving at the correct solution. The minimum requirements of the State Code impress me as not being unreasonable or arbitrary. They were quite carefully reviewed and discussed by a great many representing those industries directly concerned, prior to their final revision and promulgation by the Department of Labor and Industry. While they may perhaps be considered as not in every respect perfect, they are, I am convinced, deemed by a representatively large number as reasonable and even approaching the liberal. The efforts of those who compiled and promulgated them are laudable in their zealous desire to meet both the requirements of law and humanity without intending to impose an unnecessary hardship thereby upon Industry.

Although I speak without authority, I feel certain that the Department of Labor and Industry will at all times and in every case use reasonable judgment in exacting to the letter the stipulated requirements as set forth in the Code, relative to the stated fifteen mile radius limit from the plant as the maximum distance location for the base hospital or ambulance station in the absence of every given detail for adequate plant hospital facilities, or that provision relating to the strict requirement for an Army ambulance, or its equivalent, should several employees happen to live more than a half mile distant from the plant, or the prescribed requirement to provide either complete plant hospital facilities or Army type ambulance where the greatest number of persons employed at any one time be 15, 16, or 17 employees rather than the stipulated number as less than 15 employees, as defined in Rule 378, C AI.

My own impression is that the Department of Labor and Industry feels that certain specific regulations covering reasonable requirements of First Aid and hospital facilities are necessary for humane, systematized, carefully developed and directed effort in the emergency handling of grave injury occurring to employees, to the end that life may be saved, and that the results of injury, such as disfigurement, loss of function or permanent disability may be minimized when possible of accomplishment by recognized and advanced methods and facilities, and further, that those who suffer such misfortune shall receive the utmost care, comfort and privacy that adequate facilities and trained intelligent service may render to them in their affliction.

Generally speaking, such service cannot best be rendered in those cases of serious injury in the absence of a plant Emergency Hospital with less than the minimum facilities as required by the State Regulations. It would be preferable to be without the ambulance or the general hospital fa-

cilities, insofar as emergency treatment is concerned, providing that the plant hospital facilities, where privacy and clean major and minor surgery may be done, and where the patient may be made comfortable, and the services of well trained First Aid attendants and a skilled surgeon were available.

As permitted by the Code, such an emergency hospital may be equipped and maintained jointly by two or more operations, or otherwise may be arranged in connection with the plant office building. This latter arrangement permits of economy of construction, heating, lighting and plumbing. When standard brick office buildings are provided with hospital room of stipulated code dimensions, estimates based on the cost per cubic foot of the entire building, place the cost of the Hospital quarters at between $2,000.00 and $2,500.00. Frame office buildings provided with hospital rooms of said dimensions, and based on cubical contents, cost between $800.00 and $1,000.00. I should deem a one room hospital of said dimensions as ample for a plant employing up to 500 employees. It is desirable, if possible, to employ a full time nurse in plants having 300 or more employees, under the supervision of the plant surgeon and in compliance with the State Medical Practice Act. To furnish a one room hospital with the necessary equipment would cost approximately $600.00 to $650.00. By having an office man trained to make minor redressings under the direction, of course, and with the permission of the surgeon, further economies may be made, since the number of redressings in a plant of 100 to 300 employees averages six dressings per day. This arrangement likewise affords a ready means of making proper records, a systematized arrangement for redressings, and affords the means of close contact and follow-up system between plant and employee, an assurance of minimizing infections. Infections, as you are aware, cause a minimum of three and a half times the period of disability as do wounds that heal promptly by first intention, and sometimes infections of minor wounds may result in amputation or indeed loss of life. Moreover, it assures prompt measures when demanded and of having someone in constant attendance at the First Aid room. By adopting such a system the plant hospital will pay for itself in a surprisingly short space of time in the actual economies thus developed, all of which obviously depending upon the near availability of the doctor's office or large hospital, the cost of such outside facilities and treatment, and the extra time consumed as against the cost of furnishing dressings, nurse or attendant, and hospital maintenance. The close touch with the employee that private facilities permit, is a matter for consideration in this connection, which cannot be very well measured in dollars and cents.

In conclusion, I would reiterate that in this progressive country the force of law as well as enlightened public opinion have combined to demand, in the light of the higher ethical standards and responsibility of Industry, that those unfortunates who may suffer injury in line of duty shall be afforded those facilities of protection that human reason and human needs demand. It is with inspired confidence that the workman of today takes up his duties in the knowledge that these needs will be fully met by his employer.

List of First-Aid Cabinet Material

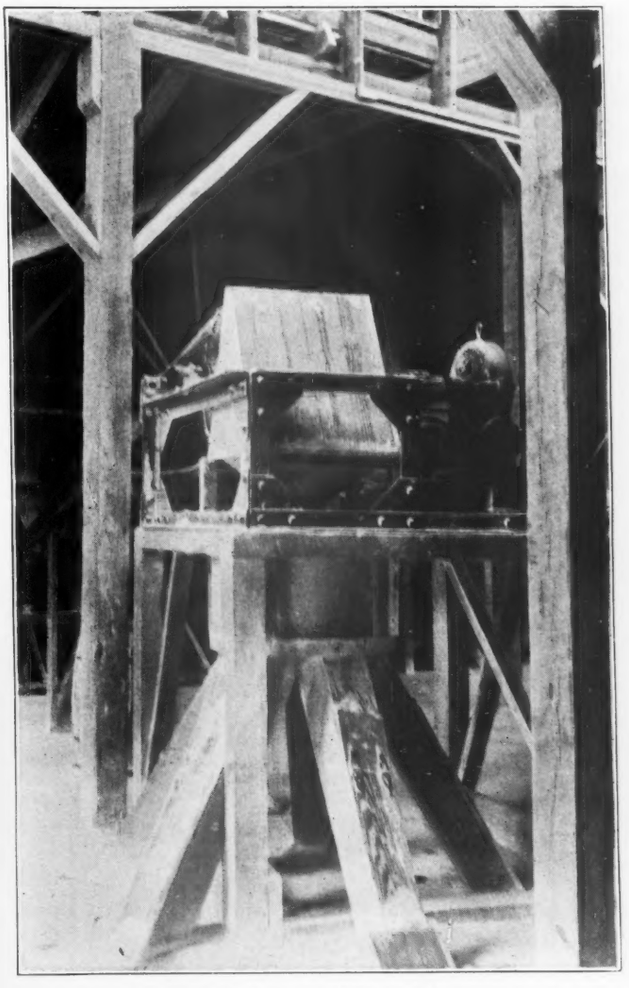
Pair of bandage scissors with leather case.
Roll of 1-inch adhesive plaster.
Dozen compresses.
Dozen triangular bandages.
Tourniquet.
Pt. 7/10 of 1 per cent aqueous solution, picric acid.
Box aromatic ammonia ampules.
Oz. hyclorite (full strength).
4-oz. bottle for dakin solution (to be made up weekly).
4-oz. bottle labelled "Sterile Water." (This water should be boiled for 20 minutes before placing in the bottle marked "Sterile Water.")
Doz. 1-inch bandages.
Doz. 2-inch bandages.
Box (5 yards) sterile gauze.
Box (4 ounces) sterile cotton.
4-oz. bottle labelled "Eye Wash."
Eye cup.
Stretcher.
Woolen blanket.
Water-proof blanket.
Thomas Splint at central first aid station inside mine (or at quarry).
Small enamel basin.
Medicine glass.
Box finger stalls.
Pair forceps.
Box peerless wood applicators.
Medicine dropper.
M. S. A. Ever Ready First Aid Packet.
Bottle boric acid.
Bottle magnesium, sulphate and glycerine (equal proportions).
Eye dressing.
Empty 4-oz. bottles.
Surgeon's soap.
No medicines such as aspirin, headache tablets, cocaine, etc., permitted.

Feldspar Milling Company Builds Modern Plant

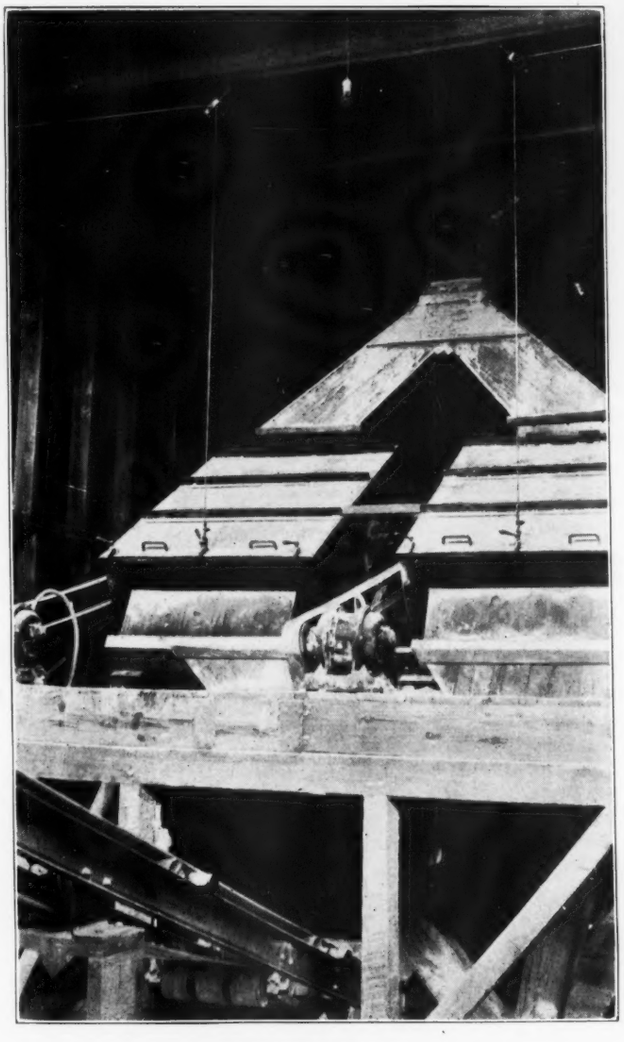
By R. CARL MOORE

ONE of the newest and most completely equipped feldspar grinding plants in the country is that of the Feldspar Milling Company, which began operation in March of this year. Situated on a 2,000-acre tract of land owned by the company and which the statement of a geologist declared contained unusually large deposits of ore, this mill is modern in every respect. It incorporates some features never before seen in the Southern feldspar grinding field and has a daily capacity of 110 tons.

The mill is located at Bowditch, near Micaville, North Carolina, on the Black Mountain Railroad. Crude rock is brought to the plant by railroad cars, trucks or wagons. Along one side of the building, on a level several feet above the main floor, is a double row of crude storage bins, separated by a runway. The outside row of bins opens on a road alongside the building, while delivery to the inside row is permitted by a truck and wagon road which runs directly through the building on a level eight feet above the floor of the bins. These bins are numbered numerically in order to prevent any confusion among the different grades of spar they may contain. There are seven bins in the outside row, but only six in the inside row, the middle bin in this row being eliminated to provide space for the primary crusher located directly beneath, and for stairs leading up from the main mill room. Both rows of bins face the runway, beneath which operate two conveyor belts, extending from opposite ends of the building to the mouth of the primary crusher. The crude ore is handled directly from the bins onto these conveyors which discharge directly into the crusher mouth. Each of these conveyors is driven by a 3-hp. motor.

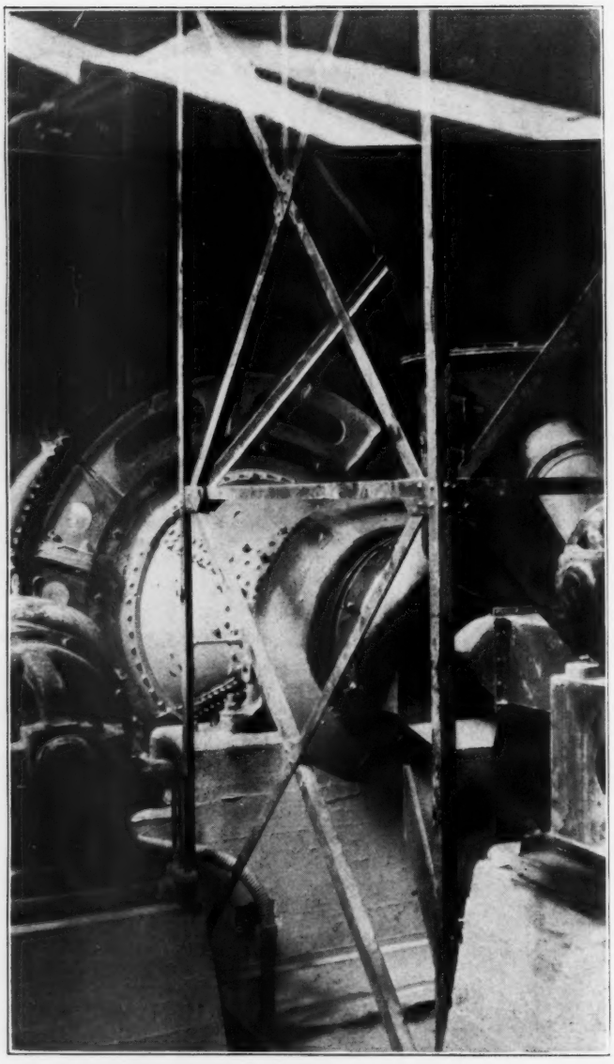


A distributor in Feldspar Milling Company's plant



Screening battery

The primary crusher is a Universal 16-in. by 24-in., water-cooled, and is belt driven by a 20-hp. motor. This crusher reduces the ore to 2 inches and less and delivers it by means of a belt conveyor



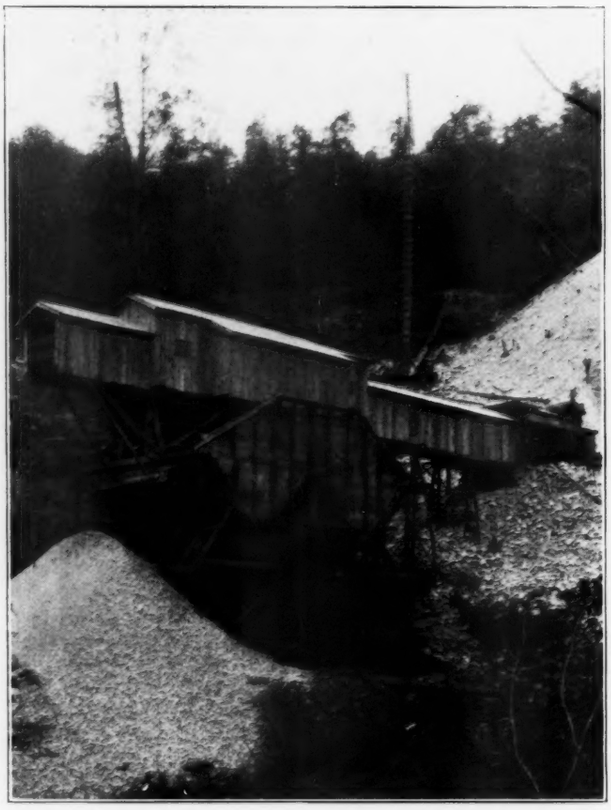
Discharge end of grinding mill

to bucket elevator No. 1, which elevates it to a link-belt coarse-mesh vibrating screen. Both the elevator and the screen are driven by a 5-hp. motor. From this screen the fines go directly to bucket elevator No. 2, while the oversize descends into the secondary crusher, also a Universal, 10-in. by 14-in. in size. After this second reduction, the material, now ¾ inch and less in size, is lifted, along with the fines, by elevator No. 2 into one of three intermediate bins. From these bins it is fed as required into the mills below. The secondary crusher, as well as elevator No. 2, is driven by a 20-hp. motor.

The size and arrangement of the intermediate bins permit the independent operation of mills and crushers. Thus the crushers frequently crush enough during the day to run the mills all night from the intermediate bins alone. This facilitates economical operation.

The plant is designed for three pebble mills, but only two have so far been set. One of these is a new air-swept type Hardinge mill, one of the few installed in the country. This mill takes the place of the ordinary pebble mill and air separator arrangement for fine grinding common in the feldspar industry. It is 8-ft. by 48-in. in size, is driven by a 5-hp. motor, direct-connected through a speed reducer, and is continuously swept by air currents. These air currents, generated by a large fan driven by a 25-hp. motor, carry the material out of the mill, classify it, return the oversize and sweep the fines by centrifugal force through a pipe to the top of the plant. Here the centrifugal action is reversed, and the finely pulverized material drops gently onto a belt conveyor. This conveyor is driven by a 2-hp. motor and conveys the feldspar to a small distributor, from which a number of wooden chutes lead to the various finished material bins below or to the bagging room. This mill usually revolves about 22-r.p.m., and is used only for fine grinding.

The second mill, also a Hardinge, is the same size as the first and is similarly driven, but is not air-swept. It is used only to grind the coarser meshes of spar. It revolves at a somewhat faster rate than the air-swept mill. The material discharges from this mill into bucket elevator No. 3, driven by a 2-hp. motor, which lifts it to a pair of link-belt vibrating screens, separately driven by two 2-hp. motors. These screens return the oversize to the mill, while the correctly sized material drops onto a belt conveyor, located near and similar in action to the one first described. This also



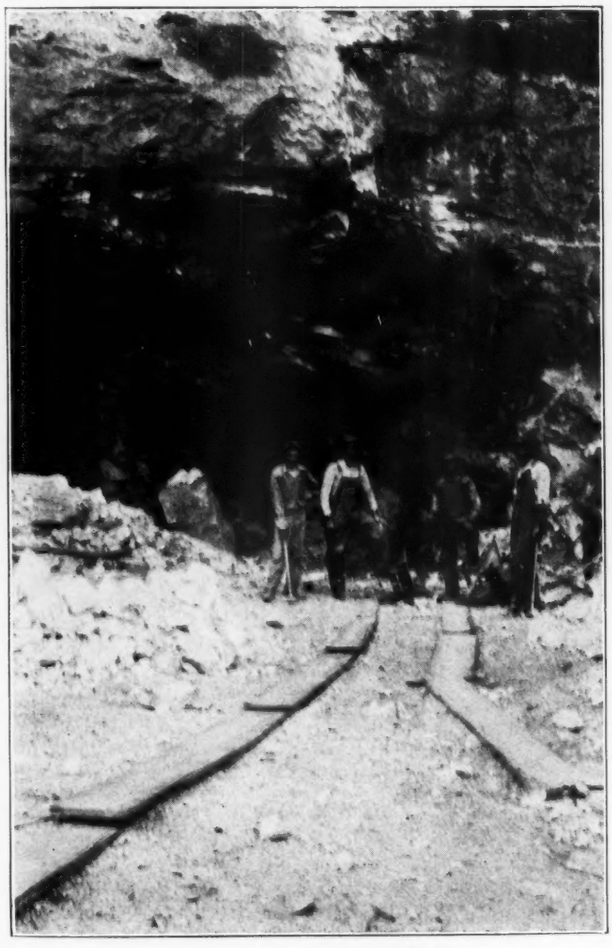
Equipment for reclaiming abandoned dump

leads to a second distributor which drops the product either to the finished material bins or to the bagging room.

The finished material bins for bulk feldspar are on the opposite side of the mill from the crude material bins. They are twelve in number, in two rows of six each, and can store a large amount of feldspar. A railroad siding runs directly beneath them and, when loading cars, chutes lead from the bins on either side of the track directly into the cars. The bagging room and bag storage warehouse take up the space under the outer row of bins between the track and the extreme end of the building, while a similar space under the inside row of bins between the main mill room and the track is devoted to the storage of pebbles.

The air-swept mill is equipped with a Pangborn dust-collecting system. The fine dust generated by this mill is carried through a pipe to the top of the mill near the distributors. Here it is passed through two shakers driven by two 1½-hp. motors, and salvaged. A pipe also leads from the coarser grinding mill, but this discharges directly through the roof and the dust is not salvaged.

All the electric motors in this plant are General Electric. All, except those at the crushers and the screens, are equipped with Foote speed reducers. The speed reducers on the mills are herringbone drive; elsewhere, worm drive. A central switch room controls the entire plant, and permits separate control of each machine from one point. Power is purchased from a public utilities company. The elevating equipment is Jeffrey.



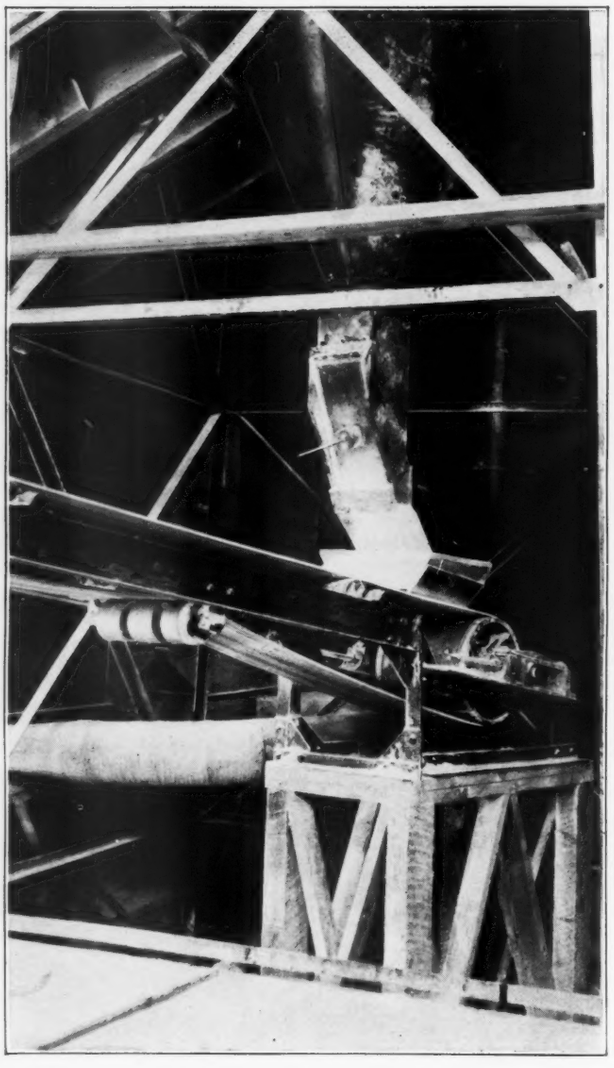
Opening a new mine mouth

Top of storage bins

To supply water for the primary crusher and Hardinge mills, as well as for drinking, a well has been dug near the mill. From this point, a Gardner-Denver plunger pump, driven by a 5-hp. motor, forces water into the building.

The office and the laboratory are housed in separate buildings erected near the plant. A number of tenant houses nearby have been built by the company for their employees. A machine shop adjoins the plant.

The company is undertaking in its mining activities an operation of some interest to feldspar operators in general. On the property is an extensive abandoned dump, the result of the operations of a large feldspar mining company some years ago. This dump contains a considerable amount of feldspar, hitherto thought to contain so much foreign matter as to render it unfit for use. The



Discharge from air-sweeping apparatus to conveyor belt

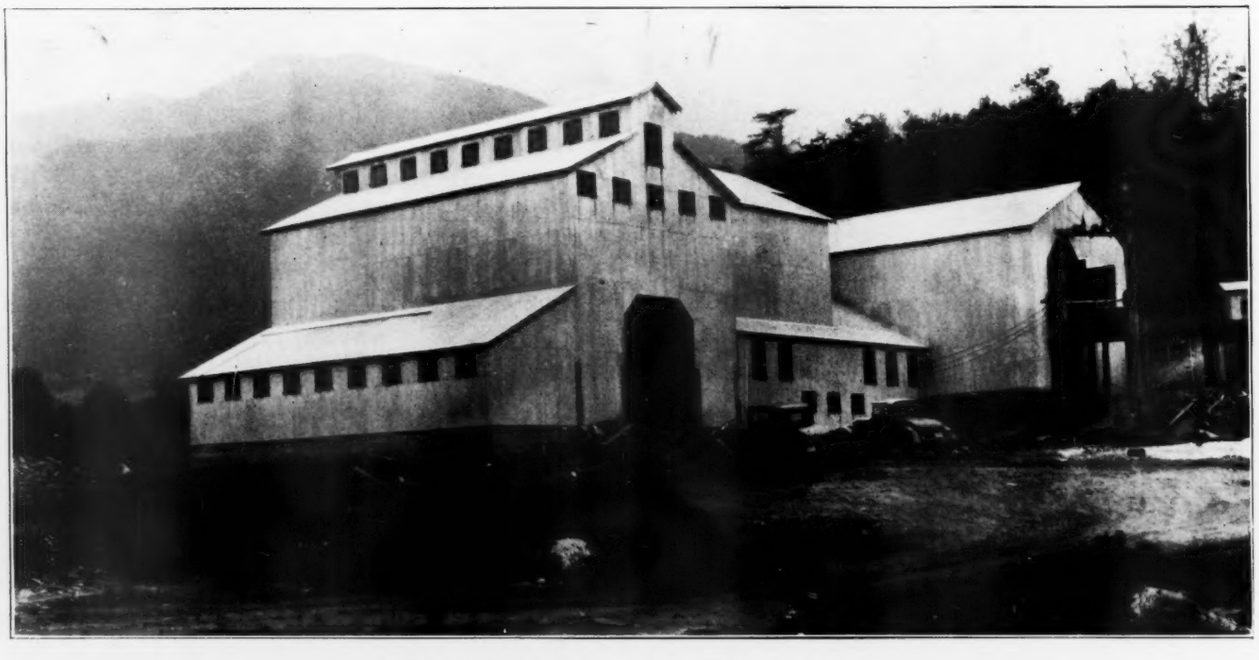
Feldspar Milling Company has gone to considerable expense in installing equipment with which they are attempting to salvage some of this waste spar.

An 11-in. by 12-in. Universal crusher, driven by a 30-hp. motor, has been installed at the base of the dump. A Mead-Morrison hoist driven by a 20-hp. motor operates a boom pole with skip attached which conveys the dump material to the mouth of the crusher. Passing through the crusher, the stone breaks along the natural lines of cleavage, and the material, greatly reduced in size, is passed along by the picking belt. This belt is two feet in width and about eighty feet in length, completely inclosed in a framework built out over a steep incline. The good spar is picked off the belt by men stationed on either side and dropped through chutes to storage bins beneath. The refuse passes off the end of the belt to a dump below. A road leads directly under the bins, permitting easy loading.

First shipment was made from this plant about the middle of last March. The analysis of this lot showed not more than 6 to 7 per cent silica, with 19 to 2 0per cent alumina, 11 to 14 per cent combined alkalis, and less than 0.05 per cent iron oxide.

The company is opening other mines, all open pit, on its property. To facilitate delivery of the crude material to the plant, a caterpillar tractor, type 30, with trailer attached, is used. Wagons also are employed. Spar is also purchased from local producers.

The officers of the Feldspar Milling Company are: C. P. Rogers, president; H. A. Dunham, secretary and treasurer; Rudolph Glatly, manager; W. B. Robinson, mill superintendent.



Feldspar Milling Company's Mill, front view

Cost Methods That Give the Executive Control of His Business

Statistics as an Aid to Determine Operating Costs

By J. J. BERLINER

IN THE study of the progress of the manufacturing situation through figures, it is not sufficient that the executive give consideration only to the bare costs of articles, or to the showings of material, labor, and expense conditions alone; for these figures, valuable as they are, are merely reflections of conditions into which enter yet other elements very vital to ultimate welfare. Without a proper knowledge of these elements and the variations, the progress and possibilities of the situation are not well brought out, and policies of operation looking towards the future (for the wise executive thinks always for the future, realizing how swiftly it merges into the present) are not well founded on the facts, or frequently are not even suggested.

A cost system must then be buttressed with statistics. These statistics should be preferably a part of the cost-department's work, since they interlace with and support the cost system, and, in fact, have to do with facts frequently already a part of the cost situation, but in connection and guises different from those which, in the form of separate statistics (for costs are merely statistics remodeled) are necessary to show their value and relation to the moving situation. Many plants, of course, have certain statistics, even when they have not costs, but such statistics can not render the most complete values.

There need be no lengthy arguments advanced as to the value of statistics. They are simply essential as a presentation of running facts illuminating conditions for the enlightenment of the executive, so that his judgment and energy may be guided by certain knowledge. Too often, without them, impressions based on isolated occurrences which are not representative tend to lead the executive astray. With them the course may not always be clear, but it is much easier to steer.

Nor are there any theories of presentation, except those dictated by common-sense, as to showing the facts so that they will make the situation quickly clear. Of course the principles of the cost philosophy apply here. Accuracy, standards, comparisons, arrangement, periodicity, as previously explained, are plainly essentials to statistics of value. Imagination, practical instinct and co-operation of the executive organization will be found to be vital necessities in the attainment of results of maximum value through statistics. The discussion on statistics becomes, then, almost a simple recital of facts to be illustrated.

It is not the scope of this article to deal with particular methods of selling nor of getting results in this vitally important department of manufacturing plants, except to point out that from statistics and their study naturally will flow suggestions of desirable or necessary policies, through indications of tendencies shown toward either good or poor results; and that, likewise, on the opposite hand, statistics will show what are the results of certain practical plans and methods.

The statistics of articles from the selling point of view have to do, in very many plants, not merely with the details of shipments, but frequently more importantly with the details of orders as they arrive. In many cases shipments are seasonable but orders must be taken well in advance, and the

ORDERS—PRODUCTION SHEET

Article	Week of 5/4			Week of 5/11			Week of 5/18	
	On Hand	Orders	Production	On Hand	Orders	Production	On Hand	
A	2,082 gross	10,118	8,260	224	12,096	11,250	(622)	Etc.
B	(1,876 gross)	2,800	1,500	(3,176)	3,200	2,508	(3,868)	Etc.
C	24,126 dozen	12,260	15,960	27,826	9,218	16,260	34,868	Etc.
D	526 dozen	300	350	576	80	0	496	Etc.
E	100 dozen	5	0	95	10	0	85	
F	82,327 dozen	57,118	72,116	97,325	65,000	62,918	95,243	Etc.
Etc.		Etc.			Etc.			

( ) indicates amount of orders ahead of stock on hand.

Form 1

volume and significance must be known continuously so that proper and economical manufacturing arrangements may be made. In other cases these facts must gauge the question of volume of stock to be made up and carried. But, more significantly, from the strictly selling point of view, it is important to know the ratio of low-profit and high-profit goods sold (for every factory has the two classes), the ratios of different grades, sizes, etc., of the same article as sold, and, especially and particularly, the progress of sales of the different lines over definite, active periods as compared with similar previous periods, for these facts gauge the market conditions and the value of means of connecting with the market, which knowledge is very essential.

Generally speaking, then, there should be detailed statistics showing volume of orders on hand of different articles, which can readily be kept up daily or weekly by adding orders and subtracting shipments; which record will permit economic anticipation and arrangement of the manufacturing situation. Likewise there should be detailed period records of sales of different articles, comparable always with the records of previous similar periods, in order to show their progress backward or forward. Forms 1 and 2 illustrate such methods. It must be understood, however, that in each business its own peculiarities must be met and the forms illustrated can only furnish general ideas. From such a form as Form 1 it is plain that a constant knowledge of the necessities of production is to be had, and this form, of course, can be varied to give this knowledge over any period, or for present and future orders. Given the knowledge of productive ability in the plant, this form, especially adaptable in the shown conditions to staple articles, becomes a definite forecast.

Form 2, if the figures are compared with the figures of similar previous periods, and if some mark is attached to show percentages of profit on the different articles, becomes very essential in the

SALES RECORD

Approx. Profit	Article	Month April	Period to Date	Month May	Period to Date	Etc.
9%	A.....	$ 2,082.95	$ 9,626.12	$ 3,187.13	$12,813.25	
20%	B.....	586.12	1,816.17	617.90	2,433.07	
15%	C.....	3,600.12	15,612.21	3,212.82	18,824.93	
25%	D.....	487.10	1,230.09	320.05	1,550.14	
40%	E.....	93.12	510.19	87.12	597.31	
12%	F.....	15,216.10	59,387.16	16,916.20	76,303.36	
	Etc.		Period Figures in Red		Period Figures in Red	

Form 2

SALES BY SECTIONS

Section	January	February	March	April	Etc.
New England...	$ 1,218.90	$ 1,326.20	$ 1,561.27	$ 1,819.16	
New York.....	13,216.51	13,528.19	13,018.17	12,812.19	
Chicago.....	4,221.63	5,320.17	3,690.12	3,218.70	
South.....	450.19	620.82	732.16	691.17	Etc.
Etc		Etc.			
Totals.....					

Form 3

struggle to keep the most profitable articles to the front.

In the matter of markets, proper statistics will show where the sales are made according to territories, and, in a varied line, even according to customers. These facts, together with some study of population and conditions of sections, show readily the proper points of attack and contact and bring about the increasing of lines, both in variety and quality, with customers already made. Forms 3 and 4 illustrate possible methods. Form 3 gives merely the viewpoint of locality of sales, and may be put into as much detail of territory and articles as desired. Form 4 shows possibility of analyzing customers' sales and comparing them with previous periods. It will be understood, of course, that none of these forms are offered for copy, but merely to suggest possibilities in different directions, in the simplest way.

The third point of value, then, in sales statistics arises in a study of the means of connection between the article and the market. This, in very many cases, will mean a study of the results from salesmen. An executive, naturally, for judgment as to value, desires to know the relation of the sales by a salesman to his salary and expenses, but with a proper cost system he should and can preferably know the relation of the profits on the sale to the cost of obtaining them, because, frequently, the salesman with the low percentage of cost to the sales may have a high percentage of cost to the profit on the sales, due to selling principally low-profit goods, or of constant concessions in price. The plant with a good selling force has made a long step toward prosperity, and a good sales force is only exceptionally built without a basis of the facts. Form 5 illustrates a method of observing salesmen's results.

The value of advertising, while it may not be always definitely measured, should be shown by statistics giving the relation of advertising cost to the sale of the articles advertised and its effect in districts, where possible.

Such statistics of selling, to which may be added others suggested by circumstances or the peculiarities of business, will keep the whole situation plain

CUSTOMERS' SALES—JOHN JONES & CO.

	A	B	C	D	Etc.	Totals
Jan.	$ 326	$ 28	$ 412	$ 6		$ 1,112
Feb.	518	128	618	10		1,326
March	107	56	729	40		1,016
April	812	210	926	0	Etc.	1,420
May	125	15	1,125	0		602
June	Etc.	Etc.	Etc.	Etc.		Etc.
July	Etc.					Etc.
Aug.						
Sept.						
Oct.						
Nov.						
Dec.						
Totals	$5,621	$1,108	$6,401	$ 180	Etc.	$14,201

Dollars only used. Cents not noted.

Form 4

as to its tendency, will keep the force keyed up to constantly bettering the results, and will lead to policies and plans for improved results.

The next important use for statistics has to do with production. It is hardly needful to repeat that, because of possibilities of cost reduction in labor and expense, the struggle in every factory is to get the maximum production in given units of time—from men, machines, departments and the factory. This struggle, to be maintained, requires the constant trail of comparative statistics.

There is, of course, an art, a trick of swift and clear illustration in statistical showing. It is neither possible nor desirable to keep great detail of production at every point, but total of articles in given periods (sometimes in units of weight or quantity, and sometimes in value) can be kept constantly with the idea of analysis downward, when desired. And most particularly is it valuable if the "squeeze point," or point of most difficult production, be found and the record of progress there be kept. With such statistics of production it is frequently necessary to show, also, certain facts of essential connection, as speeds of machines, temperatures, weather conditions, etc., to explain them and their variations.

Of course a very vital point, not to be passed by, is the relation of production to the running sales, in connection with the stock on hand, in order that proper plans for the future may be considered, and in order that neither may the sales run far ahead of the production, causing complaints of delay and cancellation, or the production much exceed sales, causing an expensive and dangerous piling up of stock. Statistics of manufactured goods unsold, on hand, almost always amply pay for their cost of up-keep. I have in mind several important concerns, which, on account of the former difficulty (due wholly, not to lack of statistics, but of illuminating statistics) lost much trade; and at least two concerns, which, because of the latter difficulty, found themselves compelled to assign. In the case of these concerns the proper statistics would have been worth thousands of dollars.

The statistics of sales and production, and, of course, of consequent completion of sales by shipment, together with the statistics of waste, labor operations, and expenses there shown, cover fairly completely the main situations, in the light of fact illustration. There are, however, as every inquisitive and investigating executive will discover, innumerable other desirable points of knowledge, which seem to demand illumination through statistics. Almost every detail of manufacture seems to be susceptible of further enlightenment. But the wise executive, before covering too minutely the manufacturing situation with statistics, will consider the possible values to be obtained, the time of what people can be properly put into consideration of such facts, and the cost of obtaining them. Where a probable real value is to be obtained, it would not be wise, of course, to pass over too quickly any investigations. But it must be remembered that, however beautiful the theory and thought that every situation is made clear by compilations of facts, nevertheless, it is often fully as great an economic folly to be overburdened with

SALESMEN'S SHOWING—B. SMITH

Article		Month Sales	April Profit	Month Sales	May Profit	
A	Month..	$ 1,012.12	$ 91.80	$ 2,062.19	$ 185.59	
	Period...	4,629.20	416.61	6,691.39	602.20	
B	Month..	300.16	60.03	417.26	83.45	
	Period...	1,213.87	242.75	1,631.13	326.20	
C	Month..	2,500.10	375.01	2,200.16	330.02	
	Period...	9,000.26	1,350.06	11,200.42	1,680.08	Etc.
D	Month..	187.90	46.98	120.19	30.05	
	Period...	512.69	128.16	632.88	158.21	
E	Month..	5.12	2.04	6.20	2.48	
	Period...	102.18	40.84	108.38	43.32	Etc.
F	Month..	8,612.91	1,033.54	9,200.12	1,104.00	
	Period...	32,650.52	3,918.00	41,850.64	5,022.00	
Etc.		Etc.	Etc.	Etc.	Etc.	
Totals, Month..		12,618.31	1,609.40	14,006.12	1,735.59	
Totals, Period...		48,108.72	6,096.42	62,114.84	7,832.01	
Sal. and Exp. Month..			502.28		532.19	
Sal. and Exp. Period...			2,082.16		2,624.35	
Percent to Profits Month..			31%		30.7%	
Percent to Profits Period...			34%		33.5%	

Period figures in red.

Form 5

facts to be studied and assimilated, as it is to depend on judgment and watchfulness alone, unillumined by a systematic trail of fact-pictures.

It is often valuable to plot the statistics into curves, particularly as showing tendencies or relations of several factors over continued periods. In general, however, such curves can show only tendencies, and they are mainly valuable to the executive who may desire to use them to make plain the situation to others above or below him. Generally he, himself, will follow the figures.

A wise method to pursue always in designing statistics is to start with general compilations covering the larger situation, and only go further into details down as the situation seems to demand. Thus the executive can generally study each situation from the large point of view, and his judgment in digging deeper will be guided purely by the apparent necessities of each situation rather than by the mere desire to compile statistics.

There is illustrated in Form 6 a combination set of statistics and costs called the "Weekly Cost and History." As will be seen, this form illustrates the whole progress of a department in labor, expense, production, and waste for week after week comparatively. It is not advised for all plants, nor as the best method to be operated continuously for any one plant, but as a method of getting a department into good shape and under control it has been found a simple and valuable method. The facts shown, of course, may be varied to suit the situation and the desires of the executive.

No executive can afford to spend the larger part of his time studying statistics, but it is only the common-sense of his duty to review the different sections of his factory situation periodically, with the idea of assuring himself of their progress according to plan, or of planning future steps of progress; and that executive who believes in his own ability or that of his subordinates to do these things purely on their impressions or judgment, is taking a long chance on his plant's success. Since so much of success depends on human effort, it is never amiss, but always well, to judge of future possibilities by past records, and statistics lend this opportunity.

Dept. 3

WEEKLY COST AND HISTORY

ITEM	Week 5/18/29	Period to Date	Week 5/25	Period to Date	Week 6/1	Period to Date
Labor						
Direct—Piece Work	$ 125.60	$2,335.39	$ 129.92	$2,565.31	$ 122.58	$2,589.74
Direct—Day Work	27.50	494.00	32.50	526.50	23.50	550.00
Average Cost per Hundred	0.244	0.242	0.25	0.242	0.238	0.242
Expense	317.93	6,019.41	198.82	6,218.23	258.22	6,476.45
Indirect Labor	20.50	220.00	21.50	241.50	20.50	262.00
Supplies	10.12	57.96	3.08	61.04	2.16	63.20
Power	107.16	2,086.78	109.12	2,195.90	118.22	2,314.12
Repair	42.96	397.78	0	397.78	15.18	412.96
Depreciation, etc	55.00	1,100.00	55.00	1,155.00	55.00	1,210.00
Miscellaneous	82.19	2,156.89	10.12	2,167.01	47.16	2,214.17
Direct Hours	5,103	123,604	5,414	129,018	4,832	134,850
Expense Cost per hour	0.62	48.7	36.7	48.2	53.4	48.1
Production	62,800	1,167,696	64,960	1,232,656	61,218	1,294,874
Average Total Cost per Hundred						
Labor and Expense	0.75	0.757	0.55	0.746	0.66	0.74
Waste						
Amount Seconds	5,024	58,380	3,897	62,277	2,448	64,725
Amount Waste	642	7,000	454	7,454	672	8,126
% Seconds	8%	5%	6%	5%	4%	5%
% Waste	1%	0.6%	0.7%	0.6%	1.1%	0.6%

Period figures to be entered in red, to distinguish them from figures of the week.

Form 6

Progress of Sand and Gravel Industry in Engineering and Research

By STANTON WALKER*

ENGINEERING and research have occupied a prominent part in the activities of the National Sand and Gravel Association for the past three and one-half years and as it will continue to receive a great deal of attention from the organization, it seems appropriate at this time to give a brief review of the progress which has been made.

The Engineering and Research Division was established in January, 1926, and, due to the cooperation of the membership, has expanded in usefulness and size since that time. When the Division was established the writer was given no instructions other than that it was the desire of the Association to take a more active part in studying the problems of the industry and in distributing correct information concerning the uses of sand and gravel.

Stanton Walker

As the work became organized, the personnel of the Division was increased to take care of the additional demands for service. At the end of the first year authorization was given to secure another engineer and the services of C. E. Proudley, then with the U. S. Bureau of Public Roads, were obtained. At the end of the second year the establishment of a Research Laboratory was authorized, and it has been in operation for slightly over a year. While the staff of the Division is still modest in size, it is large enough to function efficiently.

It is believed that the absence of a specific program in the early stages of the organization contributed materially to the success of the work. since this made it possible for us to direct our efforts on problems as they were presented and thereby to formulate a program based on experience. It was not difficult to outline a fairly definite program almost immediately. The main problem lay in selecting the most important activities from the multitude of questions and in avoiding carrying on too many projects at the same time and thus spreading our efforts too thinly. The principal activities of the Division are well known to members of the Association, since they have been outlined in considerable detail in each annual report. However, it will be of interest to give a brief review of our more important general activities and the reasons for undertaking them, and a somewhat more detailed description of the laboratory and its work.

General Activities

It was immediately obvious that furnishing engineering service must constitute an important branch of our work. Not only did this insure efforts directed along useful lines, but it furnished an invaluable contact with the problems of the industry. This engineering service has taken many different forms, and the demands for it have grown steadily from year to year. In some cases it has required only furnishing information by correspondence, and as many requests are received from those outside the industry as from those within. The most common request for engineering service, other than those handled by correspondence, have involved clearing up or endeavoring to clear up complications with specifications.

Specifications represent the only guide to producers of sand and gravel in the refining of their product. It is of utmost importance to the consumer as well as to the producer that specifications be formulated to provide for the most economical use of the material. This has made it important from the viewpoint of both the consumer and the producer that the National Sand and Gravel Association cooperate in the work of committees dealing with specifications and methods of test. This we have done to a large extent in national engineering organizations. A representative of the National Sand and Gravel Association has had an opportunity to express the views of the industry on all national specifications which have been prepared during the past two or three years; local specifications practically always reflect specifications prepared by national engineering bodies.

Closely allied with our work on various committees of other organizations are the activities of the National Sand and Gravel Association Committee on Standard Specifications. The work of that committee furnishes an authoritative background for our recommendations to other organ-

* Director, Division of Engineering, National Sand and Gravel Association. This article appeared in August 15, 1929 issue of National Sand and Gravel Bulletin, and is reproduced by special permission.

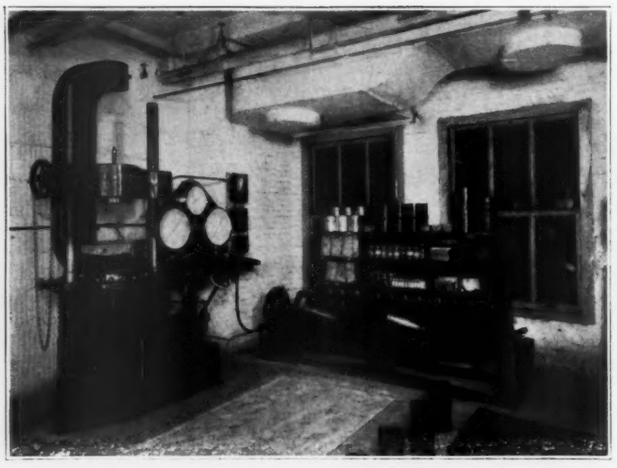


Fig. 1—General view of Emery-Tatnall machine and Deval abrasion machine

izations. Its proposed cooperation with the Division of Simplified Practice of the U. S. Department of Commerce in standardizing commercial sizes of sand and gravel bids fair to become one of the most important activities ever undertaken by the Association.

The distribution of authentic and usable information concerning sand and gravel showed itself from the first to be an important activity and to represent the most tangible method of demonstrating the usefulness of the Association. A series of technical bulletins have been issued, and others will be prepared at regular intervals. These have dealt with problems of special interest to the producer and user of sand and gravel. For example, two of them have given information on an accurate method of estimating quantities of materials for concrete which brings out the important part played by the void content of the aggregate in determining its economy. A group of pocket-sized loose-leaf data sheets have been issued containing information of a sort which either the producer or the consumer will find useful to have with him on the job. These data sheets are being issued at regular intervals, and the ultimate purpose is to compile a handbook of information which will cover all subjects of interest concerning sand and gravel. Miscellaneous articles have been published in different engineering and trade magazines, and a considerable amount of information has been distributed in mimeographed form to member companies. The National Sand and Gravel Bulletin has been a most useful medium for the publication of our data.

The publications of the Engineering and Research Divisions are distributed to a large and carefully selected mailing list. Requests are constantly received for additional copies, as are also requests from persons not on the mailing list. We have received a considerable number of requests for our publications from foreign countries.

Research organizations are continually carrying out work involving studies of sand and gravel, and it is highly important that we maintain contacts with such work and keep thoroughly informed as to the results. In many instances results of research on general subjects are published which contain data giving important information concerning sand and gravel, but which is not considered from that viewpoint. In order to obtain the benefits from such tests it is necessary for us to conduct a thorough study of them.

Description of Research Laboratory

Many members of the industry have felt that the establishment of the Research Laboratory was the most forward-looking step taken by the Association. Certainly there can be no question of its value to the industry; the work carried out in its comparatively brief period of existence has already demonstrated this fact. While the principal activities of the laboratory are being directed toward investigations of general interest to the industry, its facilities are available to member companies for the solution of individual problems. In view of the comparative newness of the laboratory, a somewhat detailed description of it should be of interest.

The laboratory is well equipped to carry out all of the more important tests of aggregates and concrete. It is located in the Munsey Building in Washington, D. C., the headquarters of the Association. This is a particularly convenient arrangement as it permits of supervision of the work with a minimum of interruptions to the general activities. The limited space available in a centrally located and popular office building has made it necessary, however, to economize in space for the laboratory. The necessity for exercising economy in the use of space, as well as funds, has caused the adoption of the policy of purchasing only that equipment needed for investigations under immediate consideration. This policy insures that, when

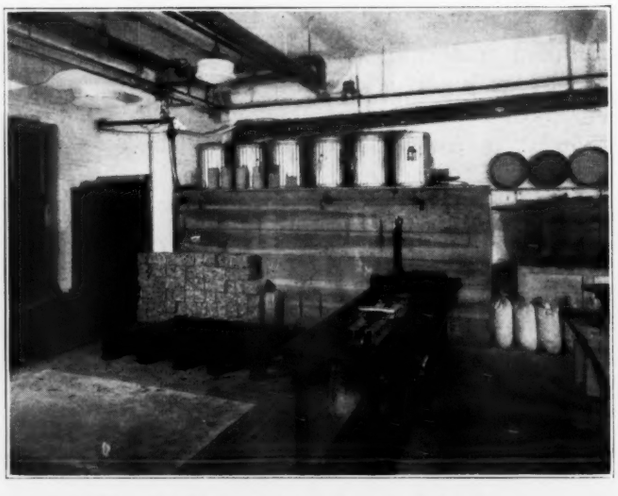


Fig. 2—General view of main laboratory

the furnishing of the laboratory is completed, it will contain only the most essential apparatus.

The laboratory was first established in May, 1928. It is housed in three rooms—the main laboratory (illustrated in Figs. 1, 2 and 3), an analytical room (shown in Figs. 4 and 5), and a constant temperature moist-room for curing concrete and mortar specimens (shown in Fig. 6). While the equipment of the laboratory may be divided roughly into three parts, (1) for concrete and mortar testing, (2) for aggregate testing, and (3) for general use, it will probably be simplest to describe it as it appears in the accompanying illustrations.

Fig. 1 is a general view of one end of the main laboratory. The large machine on the left is a new type of testing machine manufactured by the Southwark-Emery Company, capable of applying 300,000 lbs. in compression and 60,000 lbs. in tension. The machine is sensitive to loads of a few pounds to 300,000 pounds, and pressures applied by it are shown on the gauges appearing on the instrument board at the right. The chain hoist at the left of the machine is for the purpose of adjusting the head to accommodate specimens of different lengths. The testing machine was calibrated up to 100,000 pounds by Captain Petrenko, of the Bureau of Standards, using the Whittemore-Petrenko calibrating ring. This calibration was made possible due to the Bureau's interest in this new type of machine. The accuracy was found to be satisfactory, well within the limit of the 1 per cent permitted for new machines by the specifications of the American Society for Testing Materials.

In the background of Fig. 1 is seen a four-cylinder Deval abrasion testing machine, manufactured by the Riehle Bros. Testing Machine Company of Philadelphia. This machine is used for abrasion tests of aggregates. It was developed about 1870 in connection with macadam road construction in France, but with the development of the use of concrete for highway construction in this country, has become standard in tests for concrete aggregates.

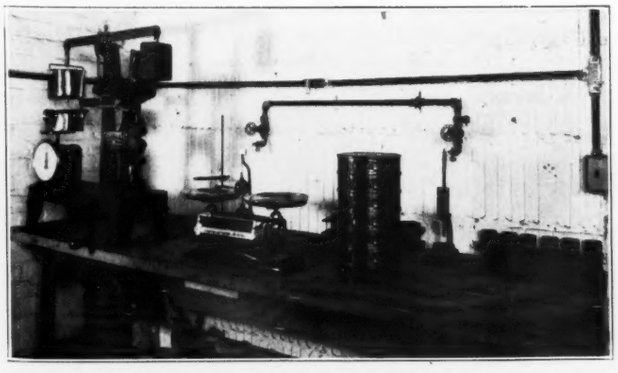


Fig. 4—Apparatus for grading test of sand and strength tests of cement and mortar

Fig. 3—Screened aggregates in bins and apparatus used in separation

Forms for molding concrete specimens may be seen at the right in the picture. The cylinders are 6 in. in diameter by 12 in. high, the size used almost universally for compression tests of concrete. The rectangular forms are for molding beams 6 in. square and 30 in. long. Other forms for molding beams 8 in. square by 40 in. long are available, although not shown in the illustrations.

Fig. 2 is another general view of the main laboratory. On the left the end of the Deval machine may be seen, and the cylinder and beam forms appear again in the center of the picture. Back of the beam forms are concrete beams which have been tested. The large wooden bin provides storage for about 20 tons of aggregate. The metal cans on top of the bin are used for storage of cement. They are hermetically sealed to avoid deterioration of the cement. At the near end of the table in the foreground is the apparatus for testing beams in the large testing machine shown in Fig. 1. It consists of an arrangement of standard structural shapes and rolled steel bars and has been designed by the Engineering and Research Division especially for use in the Southwark-Emery machine.

Fig. 3 shows bins for the storage of separated sizes of aggregate. To insure uniform batches of concrete it is necessary to separate the aggregate into several sizes and recombine them to predetermined sieve analyses. On the rack are the square mesh sieves used for separation of the materials and in the foreground is an electrical screening device. The laboratory is also equipped with screens with perforated round openings. On top of the bin, at the right, are four standard measures for determining unit weights of aggregates made in accordance with the specifications of the American Society for Testing Materials.

The main laboratory is also equipped with a Ro-Tap sieve shaker manufactured by the W. S. Tyler Company, but this is not shown in any of the illustrations. Fig. 4, however, which is a view of a part of the analytical room, shows a nest of

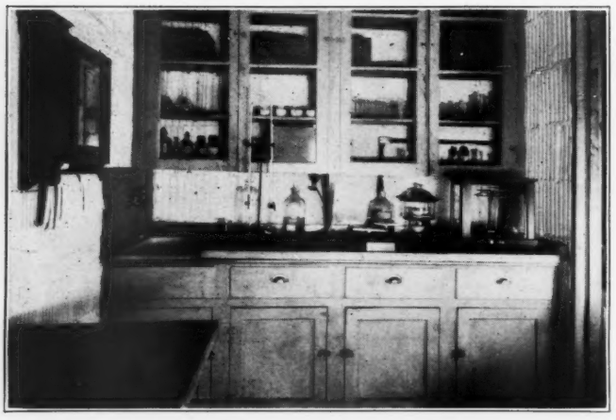


Fig. 5.—Chemical and analytical laboratory

sieves used in determining the grading of sand. Fig. 4 also shows some of the equipment used in making tests of Portland cement and mortar. At the right end of the table are seen molds for making standard briquets and behind these are brass cylinders in which 2 by 4 in. compression specimens are made. Two-inch cubes of mortar are sometimes used for test specimens and molds of this form may be seen on the table behind the stack of sieves. A Tinius Olsen cement tester of 1,000 lbs. capacity for determining the tensile strength of briquets, according to the standard requirements of the American Society for Testing Materials, is at the left of the picture. The steel table in center of Fig. 2 is used for mixing and molding mortar specimens.

While it is not intended that a complete chemical laboratory be provided until work demands it, certain facilities for the treatment of materials with chemicals and apparatus for performing standard chemical tests have been installed.

Fig. 5 shows cabinets containing glassware such as beakers, flasks, graduated cylinders and evaporating dishes. Necessary chemicals are seen on the lower shelf at the left. Hot and cold water are available at the sink at the left end of the table.

The room in which moist storage is obtained is shown in Fig. 6. Two separate nozzles, seen near the ceiling, provide a circulation of fine mist which keeps the humidity of the room at a maximum. Hot and cold water for the spray is mixed to a temperature of 70° by adjustment of valves in the supply lines. In the summer the water is maintained at the proper temperature by an automatic water cooling system, furnished by the Frigidaire Corporation. Careful records of the temperature, day and night, show only a slight variation of temperature from 70° F. At no time does the temperature go outside the permissible limits of from 65° to 75° F. In addition to storage of concrete specimens, this room is used as a damp closet in which mortar specimens are kept during the first twenty-four hours of their curing. The wooden tank, along the left wall of the room, is filled with water in which mortar specimens are immersed and so kept at 70° F. until the period of curing is complete. The proximity of the moist room to the testing machines makes it possible to test the concrete or mortar specimens under conditions of temperature and moisture prevailing in the moist room without inconvenience or delay.

Obviously, the laboratory is not fitted as a complete commercial laboratory nor is it intended that it should be. Concentration on specific researches of interest to the entire sand and gravel industry is the desire of those responsible for its conduct. Additional apparatus will be purchased, constructed or designed as the occasion arises, until eventually the National Sand and Gravel Association will have the most thoroughly equipped organization in personnel and apparatus for carrying out researches covering the many uses of sand and gravel.

Researches Carried Out and Under Way

It has been endeavored to keep the membership informed as to the status of the work in the laboratory through brief articles in *The Bulletin* and mimeographed communications.

The first investigation to be undertaken was outlined briefly in last year's annual report and a preliminary mimeographed report of it has been distributed to member companies and a limited list of engineers. This investigation constitutes a study of the effect of grading of gravel on its void content for all possible combinations of three sizes, No. 4 to ⅜-in., ⅜-in. to ¾-in., and ¾ to 1½-in. The maximum void content was obtained for aggregate all of one size or of a very limited range in grading. The minimum void was obtained with a mixture of the fine and coarse size with the intermediate omitted. It is interesting to note that the maximum variation in voids which can be obtained by changing the grading within these rather wide limits is considerably less than is usually found between average samples of gravel and crushed stone. In fact, if we may compare the results of our tests with data for crushed stone, we must come to the conclusion that the maximum void content possible for a rounded gravel is not greatly different from the minimum void content possible for ¼ to 2½-in. crushed stone.

A second investigation, along the same lines as the first was carried out, except that it was limited to sand. The trend of the curves for sand are the same as those for gravel as would be expected. The results of these investigations are being prepared for publication.

An investigation involving a study of the effect on concrete of finer sizes, such as pea gravel, in the coarse aggregate, has been completed. These tests emphasize the important effect which the quantity of mixing water plays in fixing the strength of

Fig. 6—Constant-temperature, moist storage room

the concrete and also the effect which the grading of the aggregate plays in fixing the quantity of mixing water. A preliminary report giving certain of the results was published in the June, 1929, issue of *The Bulletin*. The complete report is in preparation for publication.

Studies of washed gravel ballast in cooperation with the Ballast Committee of the American Railway Engineering Association are being carried out. Sixteen samples of gravel regularly used for ballast have been collected for test. Sieve analyses, soundness, abrasion, absorption, specific gravity and the usual physical properties are being determined for them. In addition, a study of the resistance to crushing is being made. The crushing test is also being studied for different gradings, and an attempt is being made to develop a test which will measure the frictional resistance and stability of different gravels and different gradings of gravels.

Other investigations on which work has been carried out include studies of miscellaneous sands, development of a method for making abrasion tests of concrete using the Deval machine, studies of methods of molding mortar specimens for sand tests, and tests of miscellaneous samples for member companies.

Outlines of two series of tests under way at this time have been sent to the membership. Series 8 is designed to show what variations in quality of concrete may be expected on account of differences in mineral composition and shape of particles of the coarse aggregate. Series 9 constitutes a study of the effect of variations in grading of gravel within specification limits and the effect of variations in the maximum size.

The resources of the Engineering and Research Division can be realized to their fullest extent only by the membership taking an active part in its work and, by calling on it for assistance, directing its efforts along the most useful lines. It is hoped that all members will take full advantage of the available facilities.

Conference of Engineers Recommends Wire Rope Research

Some 50 engineers, broadly representative of the many fields of wire-rope used, met in New York, September 13, at the Third Wire Rope Conference in the Engineering Societies Building and adopted the following resolutions:

WHEREAS the discussion at this Conference has revealed: (1) That wire rope is subjected to many and varied conditions of service; (2) That there is great variation in the life of wire rope; and (3) That there seems to be no accurate method of predicting wire rope life or of determining when its useful life is up

BE IT RESOLVED THAT A cooperative research committee be organized under the auspices of Engineering Foundation and The American Society of Mechanical Engineers and with the cooperation of other interested technical organizations to make a study of the factors affecting wire rope life for the purpose of: (1) Formulating rules of recommended practice for the use and inspection of wire rope; (2) Emphasizing the factors to be considered in applying wire rope to its various uses; and (3) Pointing out possible improvements that might be made in the design, materials, and fabrication of wire rope and wire-rope-using machinery.

BE IT FURTHER RESOLVED THAT The research program adopted be developed according to the present research procedure of The American Society of Mechanical Engineers.

This resolution resulted from the discussion of a series of twelve papers presented at the Conference which pointed out the use and abuse that wire rope receives and the problems that press for solution.

Among the distinguished participants in the Conference were Elmer A. Sperry, president of The American Society of Mechanical Engineers, and Dr. Conrad Matschoss, director of the Verein Deutscher Ingenieure of Germany. Mr. Sperry emphasized the present need for a better knowledge of wire rope and described a new method of non-destructive test that is showing great promise. Dr. Matschoss outlined the important research work that is being conducted in Germany on this widely used machine element and offered the cooperation of that committee to the proposed American project. Further evidence of the exhaustive study being given wire rope abroad was revealed in a paper by Dr. W. A. Scoble, reporter for the Wire Ropes Committee of The Institution of Mechanical Engineers in Great Britain.

Trinity Portland Conducts a "Safety Court" at Its Fort Worth Plant

By J. M. SIMMONS*

WE REALIZE that, in our mill, as in any other industrial plant, to prevent accidents, safety work must be ever in the minds of the employees; and to accomplish this end there must be some means of creating interest and holding interest. With this purpose in view we have organized a safety court.

A judge was elected to preside over the court, select the jury, appoint the prosecuting attorney and with such other duties as befalls a judge in regular court. A sheriff was elected who, incidentally, is a man whose regular duty as an employee requires that he go through the entire mill several times a day. It is the duty of the sheriff, on his regular rounds, to see if he can detect any employee doing a careless act or doing anything that will endanger himself or his fellow workers. Should he discover anything of this nature, he is to file charges with the court clerk who issues a notice to that man to appear in the next meeting of the court in answer to charges as turned in by the sheriff. The sheriff also notifies any witnesses that he is able to find. Any employee in the mill can file charges through the sheriff and the court clerk.

At five minutes to ten each Monday morning—our regular safety period—the plant whistle blows, indicating that the men in each department selected by the department foreman are to appear in the court room, our regular first-aid room. I might add that the foremen have no trouble whatever in getting the men to come to the court room, for they would all come if possible. It is something that they look forward to.

The meeting is called to order promply at ten o'clock and the minutes of the previous meeting are read by the secretary. We then have a short discussion on ways and means of preventing hazards, asking for suggestions from the men. We get our best recommendations from the men who do the actual work where hazards exist. These recommendations are put in the minutes of the meeting and are read the following week, giving account of the ones that have been carried out.

The meeting is then turned over to Judge A. E. Morris (shipping foreman) who opens the court by giving a brief talk on the purpose of the court, stating that it is not intended to create any personal feeling but that it is all in a spirit of fellowship and good will.

The judge then has the first case on the court docket read by the clerk, asks for corrections, appoints a jury, swears in the witnesses, and turns the case over to the prosecuting attorney. The prosecuting attorney and the attorney for the defense, (selected by the defendant) have ten minutes each to question the witnesses of both sides and the defendant himself, and five minutes each to sum up and plead the case to the jury. When the defense rests the case, the jury retires to the jury room for not more than three minutes, after which they are to return the verdict of guilty or not guilty.

In a case where the defendant is found guilty, the judge gives a talk, or you might say, a lecture to the prisoner which, incidentally, is for the benefit of the entire court on safety work, particularly safety work in line with the case just held.

As an example of our court, we will take the case of R. C. Andrews, charged with jumping over a third rail onto a moving electric quarry car thereby endangering his life and the safety record of the employees of the Trinity Portland Cement Company. Verdict: guilty. Penalty: the court will have a sign printed large enough to tie on the defendant's back with the following statement in large letters: I WAS CARELESS. The defendant is to walk up to every man in the plant before the next session of the court, turn around so that the man can see the sign and say, "See that sign, it means that I was careless by jumping over a third rail onto a moving electric quarry car, thereby endangering my life and the safety record of the employees of the Trinity Portland Cement Company."

If you don't think that this will make a person careful just get a sign and try it. In each case the penalty is different, the extent of the penalty being governed by the seriousness of the charge.

The fact was demonstrated to me a short time ago as to the impression that this plan has made on the men. I was in the packing department, just after a small repair job on a screw conveyor had been completed and the conveyor started up, to see if everything was working. The foreman told the repairman to replace the guards and the repairman replied, "No sir, not until I stop this conveyor. They'll file a charge against me sure."

So far as I know, this plan which is the idea of our superintendent, A. A. Chaney, is original in the use of safety work. We have tried record boards, campaigns, and various other methods of creating interest, but we have never had anything go over with the men in the entire plant as this Safety Court.

* Fort Worth Plant, Trinity Portland Cement Co.

First Aid Training*

By J. J. FORBES† and R. D. CURRIE‡

THE Act of Congress authorizing the establishment of the United States Bureau of Mines became effective on July 1, 1910. One of the most important duties that Congress has delegated to the Bureau is to study the health conditions among those engaged in the mineral industries. Early investigations made with a view to bettering these conditions demonstrated the need of prompt care of injured miners, as under the difficulties inherent to mining, wounds seemingly unimportant may become infected and possibly cause permanent crippling or even death if not treated promptly. In the past many seriously injured miners have been brought out of mines by fellow-workers ignorant of approved means of transportation, and have been handled so as to cause suffering and accentuate injuries to such a degree as to bring about permanent disablement. Accordingly, the need of general instruction in first aid became apparent.

In this country, education of the miners in first aid was probably first taken up systematically in the Pennsylvania anthracite region. Subsequently, first-aid training was actively carried on in Alabama and Indiana, and in the meantime a general campaign in this training among industrial workers was conducted by the American Red Cross Society. When the Bureau of Mines began its nation-wide campaign of instructing miners, however, the Red Cross turned over that part of its industrial training work to the bureau, but continued to cooperate by furnishing surgeons as judges in important first-aid contests and demonstrations. Also, the Red Cross assisted in determining the methods of training suitable for mining conditions.

In 1913 the Bureau of Mines issued Miners' Circular 8, giving instructions in first-aid work. Subsequently, when the need appeared for another publication explaining in the simplest possible language the rudiments of first-aid for the miner, Miners' Circular 23 was issued in 1916 in four languages.

Early in 1916 is became manifest that there was need of an advanced course in instruction for miners' first-aid crews who had been thoroughly trained in the rudiments; also it was evident that the methods of giving instructions should be standardized, inasmuch as contests held in various parts of the country disclosed that miners trained by different mine surgeons had been given different instructions. Consequently, a representative committee of surgeons was appointed to prescribe standard methods; the manual, *Advanced First-Aid Instructions for Miners*, was the result. This booklet was endorsed by the United States Bureau of Mines, the American Red Cross, the United States Public Health Service, and the National Safety Council. It has since been superseded by the *Manual of First-Aid Instruction for Miners*, a publication of 221 pages and now in its eighteenth printing.

The first-aid course as prescribed by the Bureau of Mines consists of 15 hours' instruction consisting of lectures and practice. It goes into details on the anatomy of the human body, the respiratory system, the vascular system, and the nervous system.

Instructions are given in caring for the injured, in artificial respiration, control of bleeding, dressings for open wounds, dressings for fractures and dislocations, dressings for burns, treatment for shock, and transportation of the injured.

At the completion of the course, which generally requires five lessons of three hours each, the Bureau of Mines issues a certificate to those who have successfully completed the course. Since 1910 and to July 1, 1929, 316,421 certificates have been issued.

In some states, the Department of Mines also issues certificates to miners trained in first aid by their instructors, and it is becoming a practice among some of the larger companies to issue company first-aid certificates to their employees who have been trained in the work.

First-aid contests have been thought to be one of the best means for stimulating interest in first-aid training, and as a result many contests are conducted each year. These affairs are sponsored by the various companies, State Departments of Mines, the American Red Cross, and the United States Bureau of Mines. Probably the most outstanding of these competitive meets is the International Contest. Last year 46 teams from 17 different companies located in 11 states competed at this contest. In some cases these teams were selected as the best, through elimination contests, from 60 or more teams. Prizes, many of them elaborate, are offered at these contests for the winning teams.

In the spring of 1923 a new idea in first-aid training was started at Thomas, W. Va., for the Davis Coal & Coke Co. This is known as the 100 per cent plan and consists of training every employee of a

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† Supervising engineer, Mine Safety Service, U. S. Bureau of Mines.

‡ Associate mining engineer, Mine Safety Service, U. S. Bureau of Mines.

mine or plant. During the past year in which more than 79,000 men were trained in first aid by the Bureau of Mines, about 40 per cent of them were trained under the 100 per cent, or co-operative plan.

Under this plan a group of "key-men" are trained as instructors by the bureau. These key-men are employees who have been selected for their knowledge of first aid, ability to teach, and ability as leaders. Their training as instructors generally requires two weeks of intensive work, at the end of which time the employees of the entire plant are divided into groups of 15 to 20 men and an instructor is appointed to each group. The instructors train their respective groups in the bureau's methods of first aid under the direct supervision of a bureau instructor. In this way large groups of employees can be given individual instructions in first-aid methods, and the results obtained are much better than where large classes are conducted by a Bureau of Mines instructor alone.

At the completion of the classes the groups are examined by the bureau men, and those who have passed the course are granted a Bureau of Mines certificate.

There are several advantages in conducting the training on the 100 per cent plan, as follows:

1. Competent instructors are provided for the plant.
2. Small groups or classes assure individual attention.
3. Large plants can be completely trained in a comparatively short time.
4. An active spirit of cooperation and fellowship is sponsored by the plan.
5. A nucleus of competent instructors is left at the plant, so that the interest in first aid does not leave with the Bureau of Mines rescue car or instructor, as is generally true under the other plan.

An outline of the course in first aid on the 100 per cent plan is as follows:

First-Aid Instructor's Outline Under Supervision of U. S. Bureau of Mines

Lesson No. 1:

1. Brief talk on first aid to the injured.
   - (a) Anatomy of human body.
2. The nervous system.
   - (a) Physical shock; cause and effect.
     - (1) Treatment; use of stimulants.
3. The lungs and their action.
   - (a) Need for artificial respiration.
     - (1) Electric shock.
     - (2) Drowning.
     - (3) Asphyxiation.
   - (b) Demonstration of Schaefer method. (By instructor.)
4. The heart and circulation of blood.
   - (a) Bleeding.
     - (1) Arterial; (2) veinous; (3) capillary.
   - (b) Control of bleeding.
     - (1) Pressure points (22).
     - (2) Digital pressure for temporary control.
     - (3) Tourniquets and their application.
5. Open wounds.
   - (a) Incised, lacerated, punctured.
   - (b) Treatment for open wounds.
   - (c) Sterile compress.
   - (d) Triangular bandage.

Lesson No. 2:

1. Class demonstrate artificial respiration.
2. Class apply tourniquets to all points.
3. Dressings for open wounds.
   - (a) Demonstrated by instructor, applied by class.

Lesson No. 3:

1. Questions on Lessons 1 and 2, by instructor.
2. Short talks on joints, ligaments, muscles, and tendons.
3. Dislocations.
   - (a) How to reduce dislocation of fingers and jaw.
   - (b) How to care for all other dislocations.
   - (c) Dressings for dislocations.

Lesson No. 4:

1. Questions on Lesson 3, by instructor.
2. Fractures, with symptoms.
   - (a) Simple fractures.
   - (b) Compound fractures.
3. Dressings for fractures.
4. Transportation and stretcher drill.

Lesson No. 5:

1. Burns.
   - (a) Kinds—dry and moist.
   - (b) Removal of clothing.
   - (c) Picric acid gauze.
   - (d) Dressings for burns.
2. Questioning of class by representative of U. S. Bureau of Mines.

At the annual meeting of the Portland Cement Association held in Chicago in November, 1928, tentative plans for first-aid training of all employees in the plants of the Association were made by A. J. R. Curtis, assistant to the general manager of the association, and D. Harrington, chief engineer of the Safety Division of the Bureau of Mines. This work was started in the early spring of 1929, and to date a total of 6,795 men have been trained for the cement association. This training was scattered over 26 states, as indicated on the accompanying map.

During this campaign of first-aid training, eight plants were trained 100 per cent and were awarded 100 per cent certificates by the Bureau of Mines. Most of the training was done on the 100 per cent plan so that this association is now quite capable of carrying on its own initial first-aid training. The bureau will gladly cooperate with plants of this association in examining classes trained by plant instructors for Bureau of Mines certificates.

Some of the advantages to be expected from first-aid training are that:

1. A man who has been trained in first aid is generally a safer man after receiving the training because he has been made to visualize serious personal injuries.

2. A trained man is an asset to any plant because he can relieve an injured employee of much suffering; in some cases he can actually save life itself.

3. Financial savings are generally realized through reduction in compensation and insurance payments.

(*Continued on page* 66)

Eliminating the Screw Conveyor Accident*

By M. S. HUMPHRYES*

ONE of the important industries in this country which contributes to the prosperity of our people is the manufacture of portland cement. This material is used in the construction of most of our civic and private buildings, for roads, pavements, sidewalks and on the farm; at nearly every place we chance to go we find some evidence of its use.

It is to the manufacture of this important material that we now turn our attention and we are forcibly impressed with the vast amount of machinery of various kinds used in the different phases of its manufacture and the hazards they present to the safety of the workmen.

One of the most common and effective means of transporting the different materials that go to make portland cement is the screw conveyor. This device is particularly dangerous to human life and limb and from the earliest days of its use has contributed heavily to the record of accidents in the cement business, many of which have ended fatally.

During the past decade very careful attention has been given to this device, with the idea of eliminating all the dangerous features and making it as safe for the workman as human science will permit.

In solving the problem of screw conveyor accidents there are three important facts to be considered.

1—The mechanical construction of conveyors and covers.

2—Safety appliances applicable to the employee.

3—Good housekeeping and safety education of the employee.

The mechanical construction of conveyors is shown in the accompanying figures which illustrate the standard construction of conveyors as developed and used in the plants of the writer's company. There are in general three types.

Figure 1 shows the construction used for standard installations, that is for all ordinary uses and at points readily accessible for its operation and maintenance. This type is built so that the cover

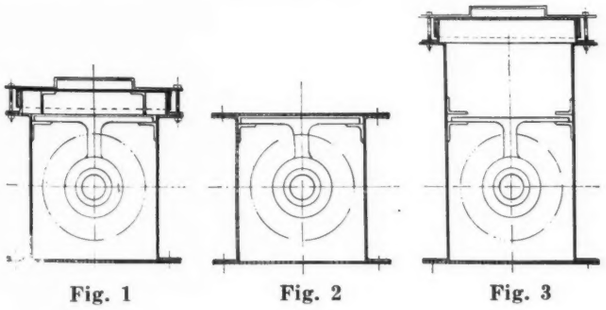


Fig. 1 Fig. 2 Fig. 3

*Mechanical engineer, Universal Portland Cement Company. Paper presented before the Cement Section of the Eighteenth Annual Safety Congress.

M. S. Humphryes

will fit over angles fastened to the box proper, like the lid of a box or pail. This allows the dust to be retained by the angles and forms a seal that prevents dust leakage into the atmosphere. Straps are riveted to the cover at convenient points, usually two to a cover, and through the ends of these straps, bolts are placed to hold the covers down tight to the conveyor box and hold it securely against removal under ordinary circumstances and yet presents the minimum of labor required in removal for repairs. The covers are normally made about four and one-half feet long which makes them easy to handle.

Figure 2 shows the construction used in tunnel installations where the head room is limited. In this type the flat cover is bolted directly to the conveyor box every 12 inches and necessarily requires more labor and time in making repairs.

Figure 3 shows the construction used in special cases where it is essential to have a large area over the screw for ventilation purposes and this space is very effective in eliminating dusty conditions around a cement mill, especially when connected to a dust ventilating system. The cover used on this type can be the same as that used in figure 1 or 2, depending of course on the conditions surrounding its installation. Our experience has proven that these types of construction are very

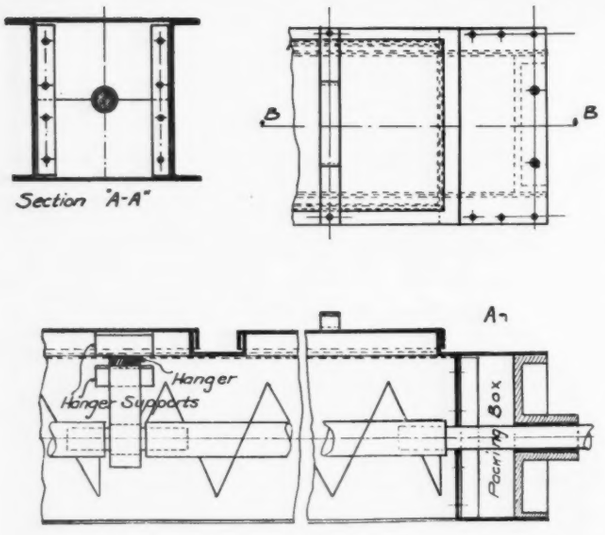


Fig. 4

effective in providing a safe means of conveying materials to different points of the mill and has reduced screw conveyor accidents to the minimum.

There are many appliances applicable to the safety of the employee which are used without detriment to good operation, a few of which follow. When it is necessary to shut down a conveyor for repairs the first act of the handyman after the switch is thrown is to place a padlock, with which every man is supplied, on the motor switch so that the motor cannot be inadvertently started by another employee, not knowing that the conveyor is down for repairs. This rule is strictly enforced and is applicable to all types of machines that are shut down for any cause whatever, either mechanical, electrical or operating.

Where it is necessary to return the spillage and sweepings from the floor to the conveyor, for return into the process, an opening is cut in the cover around which an angle retaining ring is placed and into the opening is bolted a screen or grating of such design that it is impossible for an employee to get his hand or foot through it; cover is then placed over the opening like the cover on a pail, which is easily removable. This construction is shown in Figure 5. In this way a convenient and safe method is provided for a clean up without removing the main cover of the conveyor box, which would introduce a very serious hazard.

Sampling from conveyors while in operation is prohibited and where it is necessary in the process to take samples, special sampling devices are provided, these have proved effective in eliminating accidents.

In silos and bins where it is necessary at times for men to enter, the screw conveyor hazards have been eliminated by placing the conveyor below the floor level, the same being connected to the bin by means of spouts through the floor. This construction will not allow the entrance of the human body beyond the safety point should the workman accidentally fall near or into the spout.

Good housekeeping and safety education are most essential to the safety of the employee. The practice of allowing dirt and rubbish to accumulate in large or small quantities on conveyor boxes and lids and around the floors is strictly prohibited, as these not only present an untidy condition, but offer an obstruction to stumble over and often conceal defective or loose conveyor covers.

Clean surroundings encourage the workmen to wear better clothing and inspire him to do better work, more safely, and such a condition will surely show an increase in man power production.

The personal safety of the workman is based on plant spirit and plant safety. In order to teach him to work safely he first must be sold on the company for which he is working, he must have the plant and safety spirit and must co-operate and have the co-operation of his fellow employees.

Once a workman has the spirit, he is ready to accept safety at its true value, to be educated and schooled along the lines of safety and to put forth all his efforts toward that end. He must be wide awake and alert at all times, and he will think twice before placing his hands or any part of his body near a moving conveyor or allowing a fellow employee to do likewise.

All the mechanical devices that can be applied to a machine for the safety of the workman will be of no avail, unless that workman is thoroughly educated in their use and in the safety spirit, keeps his eyes open, and uses his head while attending to their operation.

A thinking workman will seldom leave a motor switch unlocked or leave the lid off the conveyor box, thereby setting a trap for others that follow him.

First Aid Training

(*Continued from page* 64)

The Bureau of Mines has on record many letters showing the appreciation of the mineral industries for first-aid training. One of these letters received from the safety engineer of a large California petroleum company states that the benefits derived from training 1,451 men in first aid are most encouraging. It has resulted in a 50 per cent reduction in the number of infection cases, 98.5 per cent reduction in days of lost time for infections, and 95.2 per cent reduction in compensation and cost.

Another letter from a superintendent of a large plant in Pennsylvania which operates a coal mine employing about 150 men states:

It is our opinion that the effect of this (100 per cent first-aid training) training has had its effect in making our men more careful, as we have just completed six successive months without a lost-time injury in our mine.

Marble Cliff Quarries Company Manufactures Hydrate and Quicklime in Modern Plant

Other Products Are Agricultural Lime and Ready-Mixed Mortar

By THOMAS L. COLLINS

THE Marble Cliff Quarries Company, in connection with its crushed-stone plants at Columbus, Ohio—described in the October 9 issue of PIT AND QUARRY—operates a modern lime plant, producing both quicklime and hydrate. The output of this plant is approximately 30,000 tons a year, about one-half quicklime and one-half hydrate. It was erected and started operating in 1923 and runs the year round, employing about 25 men regularly.

Stone from the second bench only is used from the two quarries operated by the company in conjunction with the stone-crushing plants. The first bench, which is about 22 ft. deep, is a hard flint-like blue limestone which makes excellent road and concrete material but is unfit for lime. The second bench, however, which is about 42 ft. deep, contains a very high percentage of calcium carbonate (about 97 per cent) and makes excellent lime. In the manufacturing process there is very little waste—probably about one per cent.

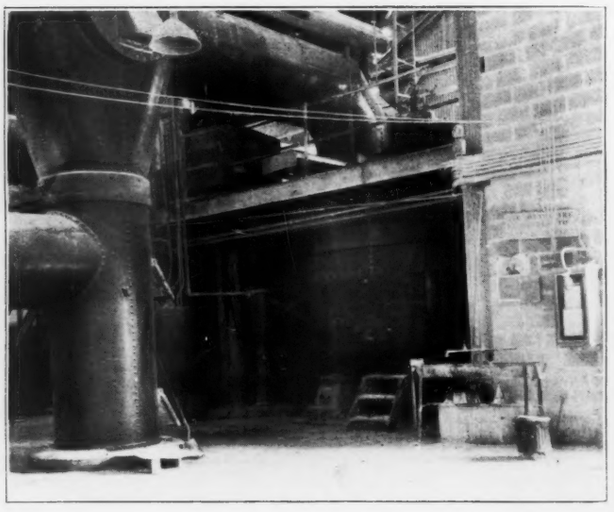
Aerial tramway, concrete bin, and bucket elevator

Storage bins (left) and mill in distance

Part of the stone used by this plant is delivered by an Interstate Equipment Corporation aerial tramway, from crusher plant near which the lime plant is located, in steel cars holding about 400 lb. There are two of these cars which operate on a 7/8-in. cable. They are automatically dumped into a concrete bin holding about 200 tons, from which the stone is fed into the kilns through chutes by gravity. The tramway is about 400 ft. long and operates by a 20-h.p. Allis-Chalmers motor. Stone is delivered to the plant also by dump cars which include Watt steel, K. & J. steel, and K. & J. wooden bodies. The carloads are dumped into a pit and carried by a bucket elevator to the same bin as the one which receives stone from the aerial tramway.

This plant produces only "pebble" lime, taking 1½-in., ¾-in. and ½-in. stone. It can produce larger, but has standardized on these sizes to meet local demand.

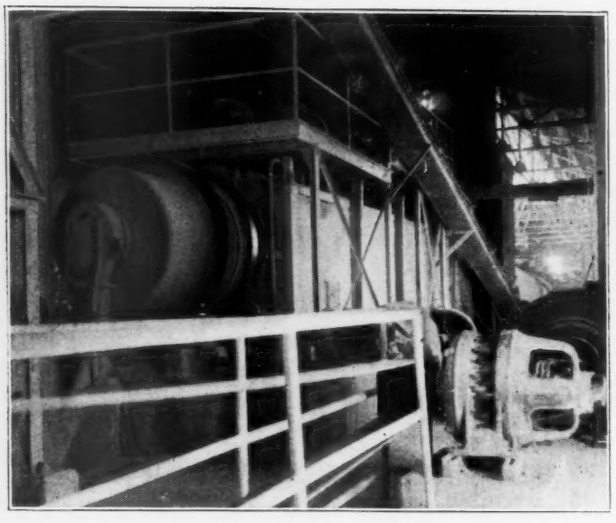
In the actual production of the lime, two rotary



Gas-making plant

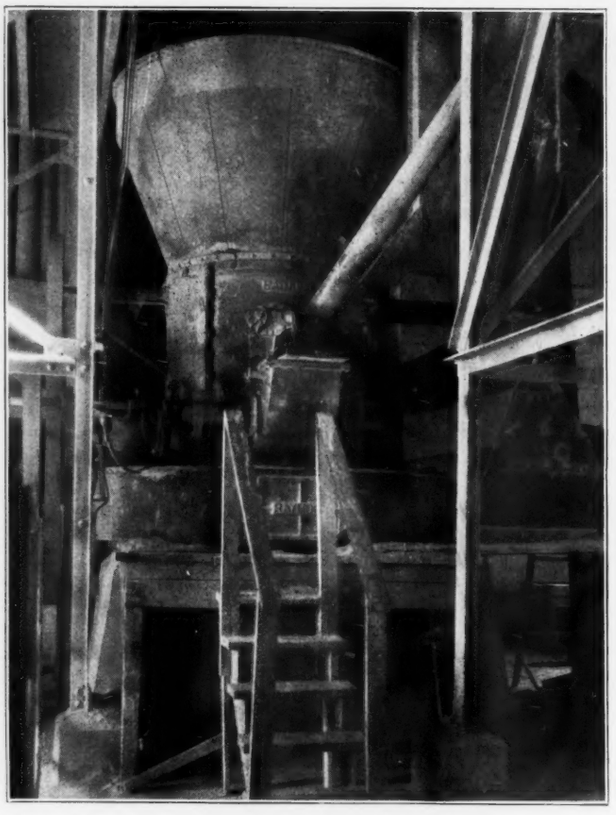
kilns are used, one of which is a Vulcan 8 ft. by 135 ft. and the other a Worthington, the Worthington having been installed three years ago. These kilns are among the largest in the world used for producing quicklime. They are made of steel with fire-brick lining. The stone feeds in at one end from the bin by gravity and through the kilns also by gravity to the lower end, where it drops into a receiver from which it is conveyed by a bucket elevator to the cooler.

Heat for the kilns is supplied by gas which is manufactured on the premises by a heavy-duty gas-making system manufactured by the R. D. Wood Company of Philadelphia. The fuel is 1½-in. West Virginia nut coal. This coal must be free from slack and clean to get the best results. To operate one kiln, about 26 tons of coal is used on a 24-hour shift. The gas is forced into the kiln under pressure and is fired the entire length of the kiln upon entrance, producing an intense heat. Less gas is used at the upper end, because here a pre-heating operation is carried out to remove all moisture from the stone. The fire zone where the burning takes place extends about 75 to 80 ft. from the lower end of the kiln.



Dryer in lime plant

From the kilns the quicklime is conveyed by a Jeffrey dragline and bucket elevator, operated by a 7½-h.p. Allis-Chalmers motor, to a Worthington rotary cooler, which was installed at the same time as the Worthington kiln. It is 6 ft. in diameter and 60 ft. long. It is a steel cylinder and the cooling process is carried on by a natural air draft. From the cooler the produce is discharged by gravity and carried by a chain drive and Jeffrey bucket elevator, operated by a 10-h.p. Allis-Chalmers motor, into the concrete storage bins.



Pulverizer for limestone

Three storage bins are used, two for pebble lime and one for fine material which is ordinarily used for hydrate. These bins have an aggregate capacity of 300 tons. Although it could be kept here for an indefinite period without injury, this pebble lime is not stored long. Because of the steady demand for both quicklime and hydrate it usually remains only two or three days.

From the storage bins, quicklime is delivered into cars and trucks through discharge chutes. Each of three bins is so arranged that the contents can either be fed to the hydrator or loaded into railroad cars or trucks. The quicklime is sold in bulk, also packed in 90-lb. bags and 100-lb. steel drums. About 95 per cent of the product is delivered by railroad cars, the balance by truck.

Valve-bag packer

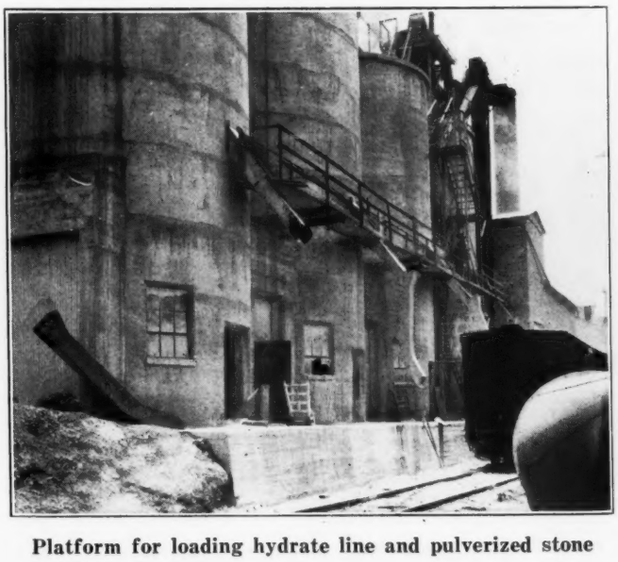
The truck business comes from local users, most of it going to the city of Columbus water-softening plant. About half of it is sold in bulk, the balance being packed in bags or steel drums. These drums offer the advantage of providing a more permanent container, rendering the contents less liable to damage, are easier to handle and provide complete protection to all sorts of weather conditions. One Bates valve bag packer is used for packing the bags.

To supply the hydrating plant, the product is conveyed by two Jeffrey bucket elevators, operated by 5-h.p. Allis-Chalmers motors, to a Schaffer continuous hydrator which has a capacity of about five tons per hour. It is operated by a 15-h.p. Allis-Chalmers motor. From the hydrator it is carried by a belt conveyor operated by a 5-h.p. Allis-Chalmers motor to two Bates valve-bag packers, where it is packed in 50-lb., 25-lb. and 10-lb. paper bags. From the packers the bags are moved by hand trucks to car or truck, or placed in temporary storage.

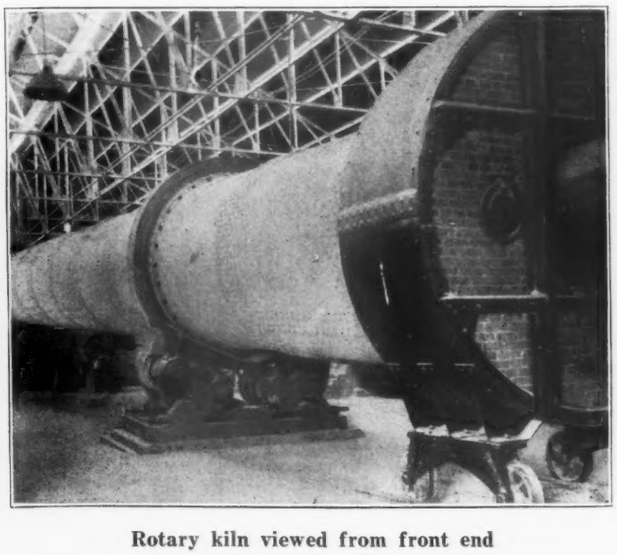
About an equal amount of the two products, quicklime and hydrate are produced. Some of the quicklime is used in the ready-mix mortar plant, which is operated in conjunction with the lime plant. This product also is sold to chemical plants for water softening, paper mills, and a limited amount for local construction work. The hydrated product is used mostly for mason's lime and, for this use, it is packed in 50-lb. paper bags; but an increasing amount is being used for soil treatment and for use on lawns. For this purpose, the 25-lb. and 10-lb. paper bags are the most popular sizes. Sales for this use are increasing because, in many cases and for certain purposes, it is preferred over pulverized limestone. The mason's lime is sold to dealers and contractors. A limited amount for use in soil treatment also is sold to dealers, although the bulk of the material designed for this purpose is sold to farmers, co-operative agricultural associations, and country agricultural agents.

No outlet for future developments is being planned or even considered by this plant for the reason that the demand for the product is large enough to take care of the entire output.

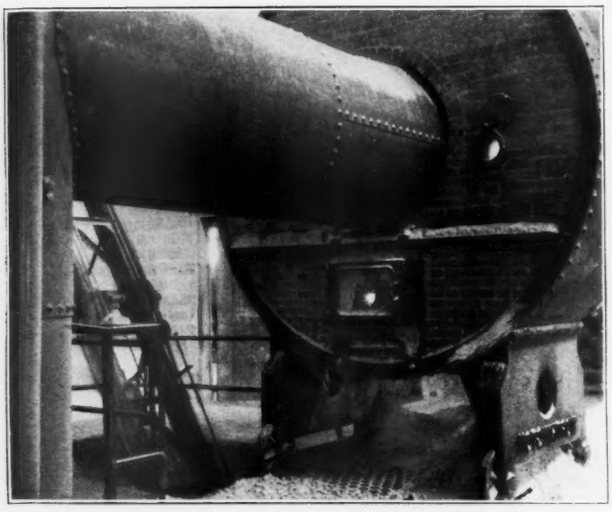
Russell Rarey,
Vice-president and sales manager



Platform for loading hydrate line and pulverized stone



Rotary kiln viewed from front end



Front of rotary kiln

Operated in connection with this plant is a pulverizing plant, manufacturing pulverized raw limestone; also a ready-mix mortar plant.

In the pulverizing plant a Raymond five-roller pulverizer and a Jeffrey 36-in. by 24-in. three-hammer pulverizer are used. The Raymond pulverizer, which has a capacity of about eight tons per hour of coarse material, carries the main load. It is operated by a 60-h.p. Allis-Chalmers motor. The Jeffrey pulverizer, which has a capacity of about 10 tons per hour of coarse material, is used in connection with the Raymond pulverizer when it is desired to increase the output. It is operated by a 100-h.p. Allis-Chalmers motor. This product is graded to any size desired, from 70-mesh to 200-mesh.

A ball mill has been purchased and will be installed soon. This is a 7-ft. by 48-ft mill made by the Hardinge Company. It is being installed because of its great production capacity and will be operated by a 150-h.p. Allis-Chalmers motor.

For the pulverizers, stone is taken from the same bin as is used for the lime kilns. It is fed by gravity through a chute into a Christie dryer, 5 ft. in diameter and 50 ft. long, operated by a 15-h.p. Allis-Chalmers motor. From here it is conveyed by dragline and bucket elevator to the pulverizer.

From the pulverizer the material is conveyed by dragline and bucket elevator to two Bates valve-bag packers, where it is packed in 80-lb. bags and conveyed by hand truck to car or truck, or placed in temporary storage.

The ready-mix mortar department, which is the latest addition to this plant, is in development and not yet on a basis of quantity production. The market is strictly local, patronized mostly by building contractors. It furnishes a lime mortar, ready-mixed, for laying up brick-work. It is popular among Columbus building contractors, who find they can buy mortar cheaper this way than can mix it. It is made entirely by machinery, the process is standardized, and hence a uniform product is produced. The mortar is sold at the plant, the buyers doing their own hauling, using their own trucks or employing trucking companies who do commercial hauling.

The officials of this company are W. H. Hoagland, president; Harold Kaufman, general manager; Russell Rarey, vice-president and sales manager; and C. B. Geiger, plant superintendent.

To Commemorate Inventor of Blake Crusher

All pit and quarry men know the Blake crusher but probably very few of them have ever learned any particulars about its invention. Now this matter has been brought to the fore publicly by the recent decision of New Haven, Conn., citizens to erect a memorial to Eli Whitney Blake. A bronze tablet in Whitneyville—Blake's home, a suburb of New Haven—will commemorate the inception of this humble, useful machine.

This inventor was, in 1852, a member of a committee appointed to supervise the resurfacing of a certain street with crushed stone—macadam—and he was impressed with the cost involved in the crushing of stone with hand hammer. The inventive strain in his family, previously manifested in the conception of the cotton gin by an uncle, asserted itself and Blake soon devised the well-known type of jaw crusher that still bears his name, although today only the type feature remains, this feature distinguishing his crusher from the later Dodge crusher, also a jaw crusher. In the Dodge crusher, the movable jaw is hinged at the bottom, whereas in the Blake crusher this jaw is pivoted at the top.

After 77 years the inventor is to be heralded as a highly useful man in industry. He never received any financial reward for his invention. In later years he was observed by scientists and engineers for a time because of a technical book that he wrote, entitled "Original Solutions of Several Problems in Aerodynamics."

New Quarry at Manitowoc

Eighty acres of farm land, recently acquired for about $30,000, will be the site for a new quarry to be opened up by the Western Lime & Cement Company, of Milwaukee, Wis.

Instructions to Granite Workers

The Federal Board for Vocational Education has issued, as Bulletin 137, a 252-page book entitled "Granite Cutting, an Analysis of the Granite Cutter's Trade." It contains specimen instruction material for the use of apprentices and journeymen workers, and is well illustrated.

Plant Surgeon's Part in Accident Prevention*

By JOHN L. ROCK, M. D.

I HAVE attended several regional Safety Meetings of the Cement Industry and was impressed by the fact that the doctor and his department was, possibly, being somewhat ignored. The Medical Department can be made one of the most vital parts of the Safety Movement. The fault may be due to the majority of cement plants not having a competent industrial surgeon as a member of the organization. My investigations indicate that most of the cement mill surgeons attend to only the treatment of the injured employees, giving little or no attention to other phases of industrial medicine which is so closely entwined with the Safety Movement that it is almost one and the same. So in the following pages I am going to attempt to show you that a competent surgeon and his department can materially aid the Safety Movement.

The Medical Department

The selection of the doctor is of prime importance. His training, character, and personality should be investigated and one with industrial experience should be selected. Many of the larger industries, such as the railroads, U. S. Steel Corporation, International Harvester and others have a number of these specially trained medical men working for them. True, they haven't had special training in the cement industry, but the medical work for all industries is much the same, and a good man can easily adjust himself to the cement mill conditions in a short time. I offer as a suggestion, in selecting a surgeon, that the chief surgeon of one of these companies be consulted and, possibly, he could recommend a young doctor that has benefited by his training and would be competent for cement mill work. First, I, personally, would prefer a young man in the profession not over two or three years out of school. He is still in the making and, possibly, more enthusiastic and ambitious, and could more readily adjust himself to conditions of cement mill. Second, a man who is a graduate of an A class medical school. The American Medical Association classifies medical colleges in A, B, and C classes. A, denoting best; B, fair, and C, poor. Third, one who has had a good hospital internship. The hospital is the place where one learns the practical side of surgery and medicine. There are a few things a doctor coming from a good hospital internship cannot do, but he will soon adjust himself to his new conditions. Fourth, one who is in good physical condition. His ambition is keener. He will work harder, and sets a good example to the people he is going to work among.

The doctor's remuneration should be considered with the amount of training he has had and the expense necessary to secure this training over a period of from six to nine years. I believe the employment of a doctor on a salary basis is preferable, for he then becomes part of the organization and naturally more interested in the medical department and its function in getting the injured employee back to work at the earliest date possible, and also in attending to other phases of the medical work which make for safety.

The Trained Nurse

I am convinced that where the cement company is sufficiently, large, and by that I mean two hundred fifty employees or more, it would be valuable to have a trained nurse as a part of the medical department. Her office hours should be much more frequent during the day than the doctor's, or, if possible, all day long. She should do all the first aid dressings. I find that with a nurse more cases reach the doctor and fewer cases of infection develop. Again, in the matter of first aid, she has developed that sense of surgical cleanliness which is impossible to develop in the first aider, and for this reason, too, fewer cases of infection develop. The first aid room is cleaner and is kept looking more like a hospital room, with less chance for infection. Then, in the matter of supplies, the nurse will effect savings by making dressings that otherwise would have to be purchased at greater cost.

In the matter of social work among employees' families by the nurse, I am not so sure whether the company benefits or not. I believe, however, that if a company appropriates money for social service among its employees, it will possibly secure the greatest benefit in the employment of a nurse.

First Aid Trained Men

There are first aiders and first aiders, but not so many are really efficient. For the benefit of the safety of the employee, every employee in the plant should have first aid training. This training teaches the employee to be more careful, and, therefore, less likely to neglect small injuries.

In the absence of a nurse there should be a well trained first aid man on duty all the time at the first aid room. He should be trained by the doctor and taught the value of asepsis in the matter of dressings. The first aider should do the dressings, and in the absence of the doctor should arrange for all patients to return when the doctor is present.

* Paper presented before the Cement Section of the Eighteenth Annual Safety Congress.

The First Aid Room

Each plant should have a well equipped first aid room. I have tried out the method of having first aid boxes or stations in each department, and find that they are not very successful. It is impossible to get a real first aid man to look after these stations, especially where the department operates on shift basis. Poor first aid work is worse than none at all. I found that all men ran to the first aid box and helped themselves, thus disarranging, using wrong materials, and causing the materials to become dirty and surgically unclean. I will cite one instance.

In one of our plants an employee went to the first aid station with a sore eye. The regular first aid man dropped supposedly argyrol in the eye. It immediately began to burn, swelled up and caused considerable pain. He had to be sent to an eye specialist and lost 40 per cent of his vision in that eye, all because some employee who had run to the first aid box had used the medicine dropper to put iodine on a wound. When the dropper was used again for this man, a large amount of iodine mixed with argyrol was dropped into his eye. There is only one exception to this. I believe a bottle of boric acid solution should be kept in each department, especially the loading. When a man gets a "shot" of cement in the eye it should be used to immediately wash out the eye. This neutralizes the alkaline reaction of the cement, and thereby lessens the irritation, which, if allowed to remain until he reached the first aid room, would add many days to his disability.

Equipped with a first class medical department, as has been described, what may you expect from it and how will the safety of an employee be aided? This I will endeavor to answer in the following pages.

What to Expect from Surgeon

The plant surgeon should spend a certain definite period at the plant each day—an office hour, so to speak. At that time all the injuries given first aid in the interval since his last visit will be seen by him, as well as the more severely injured that report daily. Some cases, if sent to the surgeon's office, would never reach it; a man, after reaching home, dislikes to get out again; hence, the small injuries are often neglected.

Every man on being employed should be given a physical examination by the plant surgeon. All defects should be noted and a record kept of them. These defects should not necessarily keep the man from working, and this examination would enable the employment department to place applicant where his physical defects would not effect his safety or that of his fellow workman, and yet applicant be competent to perform his work. A man, for instance, with heart trouble should not be placed to work around machinery where there would be a danger of his falling into it.

I do not believe a man with a hernia should be employed. The work about a cement plant is such that it predisposes to a strangulation while on duty, which renders the company liable. Then again, the hernial operation is so successful nowadays that no man should be encouraged to neglect it.

In the matter of eyes, each employee should be examined thoroughly. If his eyes test half vision or less, the employee should be sent to an eye specialist and fitted with glasses before being allowed to work, and required to wear them. Proper vision is a safeguard to the employee and a protection to the employer. The eyes are the greatest sense that warns one of danger.

I believe that every employee should be given a physical examination periodically, say, every six months and not less than once a year. The physical examination gives the company an invaluable check as to the physical fitness of the employee, and the physical defects, if treated, might save a lost time accident.

After an employee has received his physical examination for the first time, the doctor should spend a few minutes talking safety to him. The dangers in a cement mill on account of the fast moving machinery should be explained to him, and that, although the company expends considerable money to make the plant safe, 90 per cent of the safety depends on the employee himself. The medical department should also be brought to his attention; its workings explained and that he should report for first aid for the smallest scratch, as these small injuries may often become large ones if neglected, and not only cause absence from work, but possibly a permanent disability or loss of life.

Treating Injuries

As hinted before, all injuries, no matter how trivial, should be required to report to the first aid department for care. The real small ones may be treated by the nurse or first aider, but most should be required to return at the doctor's office hours, where he can give them direct attention. Here members of the safety committee and safety inspector can help the doctor by urging the employee to report to the first aid room each time that a small injury is noticed. As soon as an injury reports a careful record of the injury how it happened, department, treatment, etc., should be kept on regular accident report blanks, and these turned over to the safety department each day for investigation. Also these records over a period of time gives a pretty good check on careless employees. If a man is habitually getting hurt—and these records will show it—it points him out to the safety department as an employee that needs a little edu-

cation along safety lines. If the safety department has done all that is possible and the employee still persists in getting hurt, it is probably best to discharge him, because sooner or later the injury will be severe.

In the matter of treatment I am not going to say much except that a doctor should institute all the most modern and up-to-date treatment that is available. He should not hesitate to discard an old treatment for something new if better. He should keep up-to-date by reading, and especially by attending clinics. I believe the doctor should attend industrial clinics at least once a year, and oftener if possible. In Illinois we have a State Industrial Society which meets twice a year, and these meetings are of the greatest benefit to the industrial surgeon. Here all the latest and up-to-date industrial problems, treatments, etc., are discussed. A company should insist that its surgeon attend these or like meetings, and encourage him in doing so.

In all the larger accidents put an inefficient poorly trained doctor in a plant and it doesn't take the employees long to find it out. And it is very hard to get them to report to him. While, on the other hand, they soon recognize an up-to-date one and there is no trouble in getting them to him.

In the matter of lost time accidents, the safety department should get the most help. Many cases would lose time unless told not to by the doctor. A great many of these cases which at first would seem lost time accidents can be kept at light or easy work. All plants have a number of these jobs that the man can be put on, such as watchman, car checkers and the like. It is usually not hard to get a man to work in the first week of a lay off. He is restless and doesn't know what to do with himself. But let him lay off longer than a week and he becomes accustomed to it. Then it becomes increasingly hard to get him back to work the longer he stays away. The doctor would communicate with the employment department immediately on all these cases, so that it can arrange a light job for him. Oftentimes a man's own job can be done by him by having his buddie or helper do the heavier work. All of this can readily be arranged by the doctor talking it over with the employment department. The company is not losing anything by having the man work at these easy jobs. It would have to pay him half time anyway, and most any employee will do more than a man's work. I believe that there should almost never be a loss of time due to an injury of the upper limbs. Of course, the lower limbs support the body and here there will be a greater loss of time.

In the matter of infections I almost insist that they stay on the job unless they are hospital cases. I have found that they can be cleared up very promptly by continuous, or almost so, hot boric applications, and the only way I can get these, unless in the hospital, is by having them report to the first aid department four or five times per day. They will not follow out directions at home. Even if very little work is done it is made up by losing less time, and having no permanent disability after.

First Aid Training

First aid instructions should be given at the plant, and I know of no one more qualified to do it than the doctor. It should be the aim to have every man in the plant a first aid man eventually. I believe all the foremen should be given a rigid course in first aid, first. The foreman as a rule is better qualified mentally to receive this work than the ordinary workman. He will grasp the work quicker and make a better first aider. If the proper course is given, the foreman will jump at the chance to get it. Not only does it fit him better to carry out his safety work in the plant, but he will be greatly benefited by it personally in his own home, family and among friends. After giving the foreman this course, together with their help, certain other men of their departments picked because of their interest and special ability along those lines should be given a thorough course, and these men are the ones that should be used in case of emergency. They will just naturally fall into place as the first aid men of their departments. And for these two classes of men I think the regular Red Cross first aid course should be given. After these two classes are taken care of, then all the workmen should be given the course, but it need not be so extensive as the first. The regular safety course given by the U. S. Bureau of Mines is wonderful for this. The course is brief and takes up only the most important things.

As stated before, I do not believe in these men doing regular first aid dressings but to act in case of emergency, such as artificial respiration when necessary, stopping of a hemorrhage, splinting of a fracture, etc. Let me cite a case where first aid would have served its purpose rightfully if anyone in the department had know how to do it. A large motor was being unloaded from a flat car. One of the timbers broke and a man was caught under it, breaking his femur. He was pulled out, and with his leg dangling was taken about two blocks to the first aid room, where he was splinted up and taken to the hospital. He received a nice result as far as the bone was concerned as the result of proper treatment, but later an aneurism (dilatation of the blood vessel) developed in the region of the break. In all probability during that long trip to the first aid room the rough edges of the break sawed into the wall of the blood vessel, thus weakening it in the one spot. In time the continuous pressure from the inside caused the vessel to balloon out. To make a long story short, the man was sent to

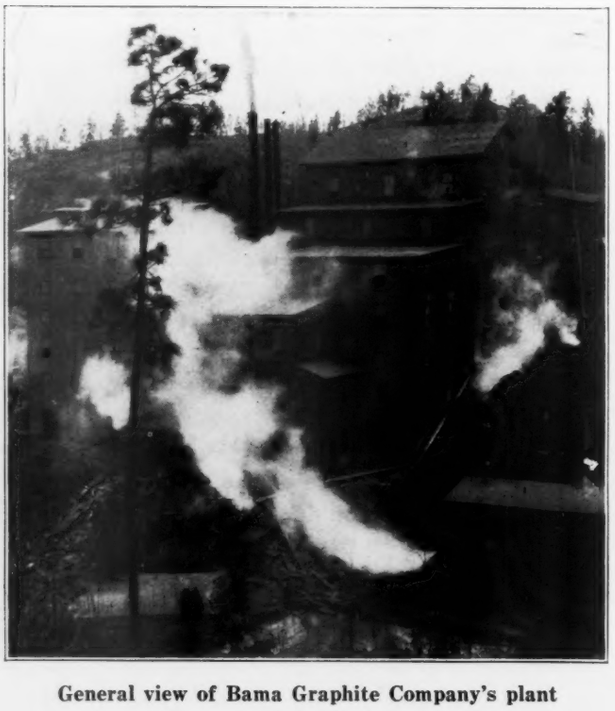
(*Continued on page* 76)

The Graphite Industry in Alabama

By JAMES R. CUDWORTH

NONE of the mineral industries of Alabama has experienced more periods of prosperity and reversals in its comparatively short life than the flake graphite. During the World War when graphite was so essential for war needs and supplies from the deposits in foreign countries were shut off, there were as many as thirty mills, either operating or preparing to operate, in the Alabama field. The production of flake graphite for Alabama reached its highest point in 1918 when 7,795,475 pounds were produced. Since that time many quarries and mills have been idle except for a brief period in 1922, when a small protective tariff on foreign supplies allowed some of them to reopen.

The struggle for life in the Alabama field has been an economic one. Here in Alabama are tremendous supplies of rather low-grade ore, which must be subjected to ore-concentration processes before they can be placed on the market. On the other hand, Ceylon and Madagascar have enormous high-grade deposits of graphite which, on account of the low cost of mining and milling in those countries, can be brought into this country at a low figure. Thus the graphite producers in the United States depend for their very existence upon a protective tariff which will allow them to compete with foreign supplies. The tariff bill at present before Congress is being watched with keen interest by all who are interested in the domestic production of graphite.



General view of Bama Graphite Company's plant

Plant of Superior Flake Graphite Company

In Alabama, the graphite deposits occur as graphitic schists, which form lenses in a series of metamorphic rocks of pre-cambrian age. These lenses are rarely over 100 feet in thickness, but are consistent and regular over parts of clay, Coosa and Chilton counties. About fifteen of these lenses or leads are known. The average graphitic content of the ore in the weathered zone is about 3 per cent carbon, while in the unaltered zone the ore is somewhat richer.

The nature of the ore calls for a rather elaborate concentration plant for separating from the graphite the impurities which are mainly quartz, pyrite, mica, and apatite. Interesting studies of the graphite ore have been made by the Geological Survey, with the idea of determining how closely the impurities are associated with the graphite flakes. A few of the larger flakes of graphite were burned in a platinum crucible, and a skeleton of silica remained, showing that an appreciable amount of the impurities are an integral part of the flake.

Mining is done in open cuts, which have so far been developed where the overburden is negligible. The quarries are usually located on the tops of hills, so as to utilize gravity in transporting the ore to the mills which are placed on the slopes. Only the weathered ore, which is comparatively soft and requires a minimum of blasting, has been removed to the present time. Steam shovels, scrapers, and more primitive appliances are used for loading the ore into tram-cars for transporta-

New opening in quarry of Superior Flake Graphite Company

tion to the storage bins of the mills. No attempt is made to hand-pick the ore at the quarries.

The flowsheets of the various mills in the district vary widely in the types of machines used. In general, jaw crushers or gyratory breakers are used for primary crushing, and rolls for secondary grinding. Flotation machines, air separators, or electrostatic separators are used for the actual concentration. The Ceylon plant of the Ceylon Graphite Company located in Coosa County uses a combination process, involving flotation machines and electrostatic separators. The ore is first passed through a gyratory crusher, followed by rolls and ball-mills, for fine grinding. From the ball-mills, the discharge is separated into three products: the fines which pass to the flotation machines, the mediums which are returned to the ball mills, and the coarse ore which is returned to the rolls. The flotation section of the mill uses ordinary flotation machines in series, which produce a finished concentrate and a tailing which is returned to the circuit. The concentrate, which is called run-of-mine, assays about 70 to 85 per cent

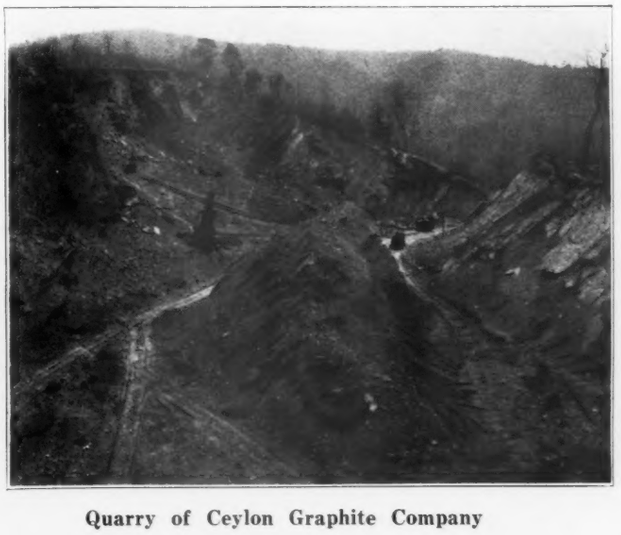
Workings of Bama Graphite Company

Plant of Ceylon Graphite Company

graphitic carbon. This concentrate from the flotation machines passes to a concentration table, and finally to a drum-type filter. It is then dried and ready for the final treatment which uses air separators and screens. The finished products are Number 1 flake, Number 2 flake and Number 3 flake and dust.

The Superior plant of the Superior Flake Graphite Company uses an all-flotation process, while the Bama plant of the Bama Graphite Company—formerly a subsidiary of the Alabama Machinery & Supply Company, of Montgomery, Alabama—uses a combination flotation and electrostatic process. These plants are the ones that have been operating most recently. In all plants, the operators have attempted to secure the highest possible recovery of No. 1 and No. 2 flake, which are the most valuable products.

The market specifications for No. 1 flake call for a graphitic carbon content of about 90 per cent and sizes which will pass through a 16-mesh screen and remain on a 100-mesh screen. The specifications for No. 2 flake call for a slightly lower graphitic carbon content and sizes between —60-mesh and +140-mesh. The major difficulty in the milling of Alabama graphite is to remove the closely



Quarry of Ceylon Graphite Company

Quarry of Bama Graphite Company

associated impurities of quartz and mica without injuring the flakes. Studies have been made at the University of Alabama, under the chemistry department, and by the chemist of the Geological Survey to solve this difficulty.

Although large areas remain to be prospected, the reserves of the known districts have been roughly estimated by the Geological Survey of Alabama, to contain 3,360,000,000 pounds of flake and 2,240,000,000 pounds of dust in sight. This is sufficient to supply the United States consumption of crystalline graphite for an enormous period without considering the other known deposits in other sections of the country.

Within the last two years there have been several consolidations of individual companies, which have strengthened the graphite industry in Alabama. The Bama Graphite Company and the Ceylon Graphite Company have been acquired by the Southwestern Consolidated Graphite Company, which also operates properties in Texas. The Alabama Quenalda Graphite Company acquired a number of properties and overhauled their plant at Linesville, Clay County, preparatory to resuming operations. The National Graphite Company and the Griesemer Graphite Company were reorganized by the United States Fuel Company of Birmingham, Alabama. Several of the companies are planning to reopen in the near future on an enlarged scale.

The future of the flake graphite industry in Alabama depends upon the extent to which it can meet competition both foreign and domestic. There is undoubtedly an enormous tonnage of raw material available and the prospects for development are promising if the operators are given protection against the high-grade, low-cost, foreign deposits.

The writer wishes to acknowledge the kindness of the Geological Survey of Alabama, for the use of material and photographs used in this article.

Plant Surgeon's Part

(*Continued from page 73*)

Chicago, to a specialist for operation. He nearly died of hemorrhage and finally came out with some permanent disability. All because his leg was not splinted at the place of injury. Aside from the actual first aid work they can do, it makes the men better safety men. They are more on the alert and will not let small injuries go, nor suffer the other fellow to do it.

The doctor should inspect the plant at regular intervals, especially paying attention to health and sanitation problems of the plant; such as disposal of waste, unhealthy practices, as promiscuous spitting, urination, poor ventilation and improper lighting, etc. An unhealthy individual predisposes to accidents, as does poor lighting, heating and the like. If these inspections are done in the right manner, the contact with the men will help to develop a much better feeling toward the medical department, causing them to feel the doctor has a real personal interest in their welfare.

Safety Meetings

The doctor should attend all safety meetings. Accidents that have happened since the last meeting should be reported and their progress in healing noted. Their exact nature often gives the safety committee valuable information in their investigation of cases. An exchange of medical problems and safety problems can be made very beneficial to both the doctor and the Safety Committee. It is a good way to find out the workman's criticisms of the medical department. And oftentimes these faults can be adjusted, and things that the doctor did not think of, and on their face seemed trival, were very important to the workman. It is always well to get the workman's viewpoint if you wish to make a success of your department. And finally the congenial association with members of the safety department is invaluable to the doctor. If of the right type he forms friendships which will carry him out of many a difficult situation.

I am sure that after creating a medical department in your plants such as I have attempted to describe, and the department carries out its duties as has been set forth, your safety department will get some real help from it.

Largest Concrete Plant

Construction of the largest concrete mixing plant in the world is contemplated in connection with the erection of the San Gabriel dam near Azusa, Cal. That is the prediction of M. H. Slocum, foreman of construction for the engineers in charge. The plant will include four of the largest concrete mixers ever built.

Denver Has Thriving Ready-Mixed Mortar, Putty and Stucco Plant

Products of Desired Colors Are Supplied to Local Contractors

By JOS. C. COYLE

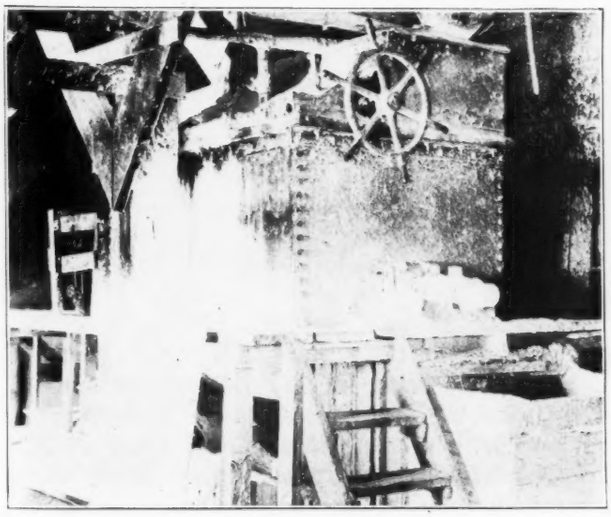
THE Denver plant of the Blue Diamond mixed mortar company, though only three years old, is a thriving establishment; and eighteen trucks, mostly one-cu. yd. Fords, with some one-cu. yd. Chevrolets and five-cu. yd. Macks, are kept busy supplying mixed mortar, putty, plaster and stucco to contractors of the city. That the company is proud of its achievement in the manufacture of the last named product is evidenced by a large set of panels, on the end of the plant facing the Fourteenth Street viaduct where thousands of people pass daily, showing the several colors of this material which are manufactured at the plant.

The panels on the building are of stucco in colors

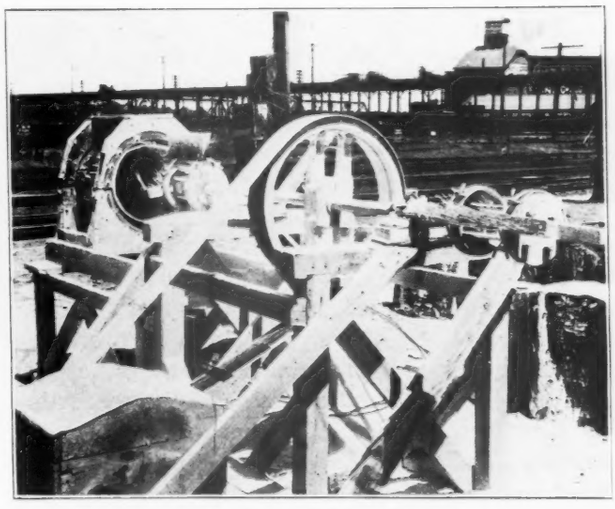
Colored mortar is also supplied to the trade, ready mixed by special machinery, designed for this plant. Sand and lime putty are drawn from storage at the top of the plant into a ½-cu. yd. Blystone mixer and coloring matter is added from sacks nearby. After mixing this colored mortar it is poured into a large metal bowl, resting on small wheels on a circular track. Through an opening in the bottom of this bowl the contents are discharged into any one of four vats, holding approximately four cu. yd. each, through metal chutes. Loading from these vats is accomplished by gravity. Thus, four colors of mortar may be prepared for loading in close succession.

Sand, for which there is approximately 900-cu. yd. storage space at the plant, is dumped into a 30-cu. yd. pit from trucks. From this it passes in an 18-in. home made bucket conveyor to the top of the plant, where it pours over a 36-in. by 48-in. Traylor vibrating screen, with ¼-in. mesh, and into a bin below. From this bin a 14-in. conveyor takes the sand to the storage bins in the top of the plant. Lime is wheeled from cars to the crusher, from which it is also carried by a 14-in. conveyor to two 20-ton storage bins at the top.

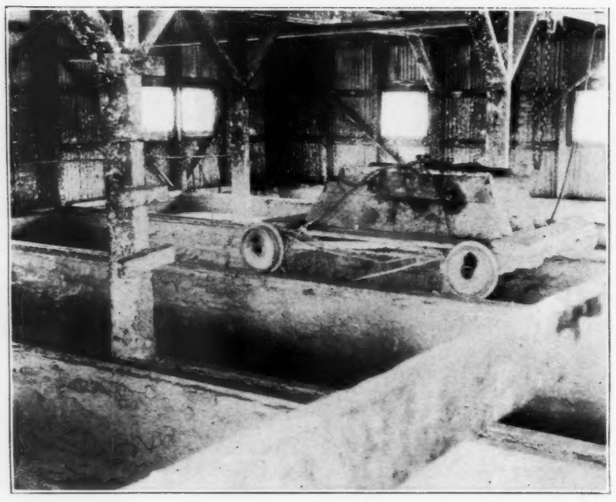
From these bins the lime is run into a one-ton slacker, manufactured by the Ajax Iron Works, of Denver. From the slacker it is piped to the curing vats on the first floor. Here the "white coat" is allowed to cure for from 30 to 60 days, in six vats which are 7 ft. wide, 6 ft. deep and 30 ft. long. Ordinary putty is allowed to cure for three to four days, in a second set of six vats, which are 5 ft. wide, 6 ft. deep and 30 ft. long. After curing it is pumped to two 400-gal. tanks



One-ton lime slacker



Apparatus for cleaning cans



Vats for curing putty

in the top of the building, as it is needed. Each unit of the plant is operated by a separate motor, which are of Western Electric and General Electric make.

A great deal of the company's product is delivered in large metal cans and a unique device which has been developed is a scrubber for cleaning these. An 8-ft. drive-shaft was mounted on a trestle, 3 ft. high, and connected by a belt to a 1½-hp. motor. Two large steel bristle brushes were clamped to a circular head at each end of this drive-shaft. The cans are placed in a wooden holder, which clamps over the top and holds them firm. This holder fits on a track of strap iron and is shoved against the machine, the brushes entering and cleaning the inside of the cans in a moment.

Occurrences of Canadian Gypsum Deposits by Provinces

The Development Branch of the Canadian Pacific Railway has issued the following information in regard to the gypsum resources in Canada:

The greater portion of Canada's production comes from Nova Scotia, which province exports most of its production to the United States. The chief producing center is in the vicinity of Windsor at the head of the Bay of Fundy, in the territory served by the Dominion Atlantic Railway, a subsidiary of the Canadian Pacific Railway system. This gypsum area covers 147 square miles and contains innumerable exposures of gypsum in cliffs up to 150 feet in height. It is from this district that the United States Gypsum Company, the largest producers of gypsum products in the world, obtain their high grade material. The supply of gypsum can be considered commercially inexhaustible in this locality. Other important deposits are found at Antigonish and in Cape Breton Island at Iona, Baddeck, St. Anne, Ottawa Brook, Ingonish, Mabou and Cheticamp. The Canada Cement Company in 1927 acquired extensive deposits at Antigonish and a very important production is expected to result. During the past few years several operators have increased their plants and some new companies have started operations, and it is evident that Nova Scotia is destined to occupy an increasingly important place as a gypsum producer. In all, there are some 52 distinct gypsiferous areas covering 627 square miles. These areas include known deposits which are as yet undeveloped.

In the province of New Brunswick, a beautiful white gypsum is extensively mined at Hillsborough, Albert County. Large deposits also occur at Petitcodiac, Westmoreland County, and at Plaster Rock in northern New Brunswick. The Magdalen Islands, Quebec Province, also have workable deposits.

Well-known deposits occur in the Niagara peninsula of Ontario along the valley of the Grand River. The principal workings are at Paris, Caledonia and Lythmore, where beds up to 11 feet thick are mined. Other occurrences have been noted near James Bay in northern Ontario about 40 miles south of Moose Factory.

A large deposit of gypsum is worked at Lake St. Martin near Gypsumville, Manitoba, about 170 miles north of Winnipeg. There has been continued production from this deposit since 1900. There are also deposits at depth in Southern Manitoba, 18 miles east of Dominion City, on the Canadian Pacific Railway, 55 miles south of Winnipeg; at Rathwell, on the Canadian Pacific Railway 70 miles west of Winnipeg; and also at St. Elizabeth, St. Arnaud, Leifur and St. Charles.

Several deposits of gypsum are known to occur in northern Alberta, including one at Slave Lake. These, however, are not accessible to the railway at the present time.

The gypsum industry of British Columbia is now on a producing basis, three deposits having been worked during the past year, including one at Mayook on the Crows Nest Line of the Canadian Pacific Railway; at Canford on the Kettle Valley Railway; and also at Falkland, 44 miles south of Kamloops. There is a promising deposit on the main line of the Canadian Pacific Railway near Ashcroft, 223 miles east of Vancouver. Other deposits occur near Spatsum on the main line of the Canadian Pacific Railway about 189 miles north-east of Vancouver; on the banks of the Thompson River, about 20 miles north of Kamloops; at Merritt in the Nicola Valley on a branch line of the Canadian Pacific Railway, 208 miles northeast of Vancouver, and in the Tulameen district about 10 miles up the Tulameen River from the town of Princeton. There are also deposits in the eastern part of British Columbia about 75 miles west of the Crows Nest coal district, at Bull River, Wardner, and also one at Mayook in addition to the deposit now producing.

Why Not Give the Other Fellow a Chance?

By R. N. VAN WINKLE

A MAN remarked the other day that "It is better to keep your mouth shut and be thought a fool than to open it and remove all doubt." As there is no alternative in this particular case, we being fools either way, or imagine that we are, the writer for one would rather remove all doubt by opening his mouth once in a while by having his say.

By far too many men engaged in the crushed stone industry are being misguided by thinking it is a wise course to keep their mouths shut. Such a course is nothing but sheer selfishness on their part as far as the good of the industry, at large, is concerned and is one of the real reasons why our industry does not rank today alongside kindred industries.

The operation and management of crushed stone quarries and in fact the industry itself, to my way of thinking, is being passed on by word of mouth and costly experiments. No comprehensive data, references, reports of treatises are being written nor have been written which would be a helpful guide to the young man entering the industry. We are as bad as the American Indian with his sign language which was passed down by word and sign to the younger generation until today, owing to the decline of the Indian, it is lost and forgotten.

So far in our industry the younger men have either learned the ins and outs and the inside intricacies by word of mouth and association with the experienced operator or manager or have rushed in on their own hook, ill advised and inexperienced and have either learned by costly mistakes or by absolute failure, either method of which does not help the standing of our industry one bit.

It may seem, at first blush, smart to appear and be referred to as a "wise old owl" and to follow the theory that "It is better to keep your mouth shut." If you do, you are selfish, unwarrantedly selfish, for what does it avail you to be ever so smart and wise in your own chosen line if you are going to keep this information and experience wholly to yourself and to take it into the great beyond where it may avail you nothing but the reputation of being selfish and niggardly while on earth.

One of the greatest blessings a successful executive or operator has is his ability to help his fellow quarry men and his own employees. A man's success in his chosen line of endeavor or industry as well as in his community should not be reckoned by the dollar-and-cent standard which we are so prone to use as our measuring stick today. A certain amount of such success is imperative, the writer realizes, but when that point has been reached a man should be willing and not only willing but glad to open his mouth and contribute whatever he can, no matter how small, to the good of the industry and to the guidance and assistance of the younger generation of quarrymen.

For the present day executive and operator, if he be the high type of modern business man, there should be something to interest him beside the making of dollars. If he is the high type of modern business man, he is of a creative temperament, constructive and a builder. He should and does get more real thrills out of coordinating the brains and hands of an organization in accomplishing something of real importance than he does piling up dollars in the bank. He should be willing to share his fund of information with others in the industry and he should be keen to develop, tutor, and push ahead the young men in his own organization.

Every successful executive or operator can trace his success to the organization he has built up or created. These organizations just don't grow or just happen but are the final results of his being first a student of men, a good picker of men, and then a tireless tutor of these same men, developing them by stages to where they are as proficient as the teacher and lack only, maybe, the seasoned experience of the teacher or tutor. That experience time alone and not teaching will bring them if they apply themselves.

Personally the writer is not an advocate of this Brotherly Love and Community of Interest proposition, and it is not this he has in mind. Thomas Jefferson once said, "If you would trust men, you must train them." The writer agrees with him in the fullest and even goes a step further and believes in sharing openly and frankly the profits of experience in our industry with others and learn to share the profits of others' experience.

Be a man-maker in your own organization. Don't encourage ignorance in your own men by keeping them in darkness as to what is going on and being accomplished within your own company and the industry as a whole. Educate them, enlighten them and make in so far as possible leaders out of them for it is in this way you will be able to get the greatest possible service out of your men. Our lives and business are so complicated in this machine age that we translate, too often, human existence into terms of money. Why not reverse this and make a wise move by bringing the human interest into our business. This can be accomplished by giving the other fellow a chance. All

(*Continued on page* 81)

Daily Control Sheet for Executives

By WALDO HUTCHINSON

THE purpose of the Daily Control Sheet is to give an executive, day by day, the significant facts concerning his business. Such facts must necessarily be few, summarized in form, and in some cases approximated rather than a hundred per cent, correct. If the picture presented to the executive is satisfactory, the report is noted and filed. If the situation, however, is disturbing, the executive will call for additional information on specific items so that he may readily change plans or policies.

The Daily Control Sheet will naturally vary in form with the requirements of particular establishments, hence it is to be understood clearly that the form presented is merely suggested and that it is expected that each concern will adapt the same to meet its own needs.

The Daily Control Sheet attempts to unite in a single form the facts concerning Finances, Orders and Shipments, Production and Operations.

The information given of a financial nature is fairly well standardized and requires perhaps little comment. The blank calls for information concerning cash receipts, cash disbursements, bank

DAILY CONTROL SHEET

COMPANY _____ DATE _____

FINANCES

CASH RECEIPTS				ACCOUNTS RECEIVABLE	
CASH DISBURSEMENTS				ACCOUNTS PAST DUE	
DEPOSITED IN BANKS				ACCOUNTS PAYABLE	
BANK BALANCE				BANK LOANS	

PRODUCTION ORDERS AND SHIPMENTS

	TODAY			MONTH TO DATE			SAME PERIOD LAST YEAR	
	Quantity	Value	Percent of Normal	Quantity	Value	Percent of Normal	Quantity	Value
PRODUCTION								
ORDERS								
SHIPMENTS								
UNFILLED ORDERS								

OPERATIONS

TIME LOSS:	MAN OR MACH., HOURS	PERCENT STANDARD OPRTG. HOURS	MATERIAL SCRAPPED OR SPOILED:
a Shortage of Labor			QUANTITY
b Shortage of Material			VALUE
c Shortage of Work			PERCENT ACTUAL PRODUCTION
d Shortage of Equipment			
e Breakdown of Equipment			
f All Others			
TOTAL			

EMPLOYEES: BY OCCUPATION	NUMBER Standard	NUMBER Actual
HIRED		
DISCHARGED		

A simple form whereby the essential figures can be presented daily for executive study

deposits and balances, bank loans, accounts receivable, accounts past due, and the accounts payable. The accounts past due are given so that the executive may act quickly to save accounts which appear doubtful.

The production Orders and Shipments section is designed to show the relation between orders received, goods shipped and goods produced. It is expected that the executive will establish a form, standard, or budget of what ought to be produced and what orders should be received and shipped daily.

In addition to this daily record, cumulative totals for these items are shown, which cumulative totals it is advisable to compare with the corresponding period of the previous year.

The information given under Operations is designed to give the executive some idea of the time lost in operation, and of the material scrapped or spoiled. If these items are unduly large, the executive will investigate the causes and suggest or work out corrective measures. There is also given the number of employees by occupation, both actual and in comparison with the standard, so that the executive may be able to note the effect of a rise or fall in production upon the number and character of the men actually employed. The number of men hired and discharged is provided for. If the number discharged is excessive, the manufacturer will probably call in his personnel man for an explanation.

The Daily Control Sheet is intended to supplement not to supersede, the weekly analysis of the payroll, the weekly statements of purchases and of delinquent deliveries, of raw, processed and finished material on hand, and the monthly statement of assets and liabilities of earnings, and monthly analysis of sales, of material consumed, of factory burden, and of cost variations.

"Delivering the Goods"

Under the above title, PIT AND QUARRY *recently distributed a little book designed to acquaint those interested in the pit and quarry industries with the editorial aims, standards and personnel of the most widely read trade paper in their field. Already this brief statement of purposes and fitness has won wide and loud acclaim, and hundreds of requests for extra copies have been received within the past two weeks. A reprint will, therefore, be necessary and requests for copies are now being entered.*

Although every effort was made to insure a representative distribution of this booklet, it was obviously impossible to reach everyone who might be interested. Hence, the publisher will be glad to mail a copy to anyone who, for any reason, may not already have received his. Requests addressed to the Editor, PIT AND QUARRY, *will be cared for in the order of their receipt.*

Give the Fellow a Chance

(*Continued from page 79*)

of us have a resistance to routine work. It's human nature that we do our best and are at our best when we are doing or engaged in doing something we like, something we are interested in. Try to reduce or eliminate, if possible, this resistance of the worker by finding ways to make his particular job attractive, pleasing and interesting. Win his confidence and be loyal to your own workers and they, in turn, will be loyal to and have confidence in you.

The writer has always been interested particularly in the human element phase, the man-power side, the personal equation and the training of younger men of the crushed stone industry; and he is a firm believer that success or failure in our industry as in all other industry, is based practically 100 per cent on organization.

The degree of success attained is traceable directly to the efficiency, morale, and standard of the organization one is able to create, build and maintain. Show me an organizer, and ten to one he is a successful operator and executive. These ideas of mine are the real excuse for the writing of this article and it is my hope that it may open up to some operators and executives in our industry a new avenue of action and thought by prompting them to look over their own organizations with the idea in view of giving the other fellow a chance. It will be interesting and profitable, the writer will guarantee, and it is much better than the policy of strangulation used by some executives and operators even today in not alone handling their own organizations but in dealing with their competitors.

Quite often a superintendent or executive is inclined to be indifferent towards his employees and subordinates, getting the idea that, due to his position, his time is too occupied with the bigger and seemingly more important affairs, leaving the details to others. Don't be misguided that handling employees and organization is a detail to be left to others, for it is one of the biggest and most important affairs in successful industry today.

World Engineering Congress in Tokio

A great gathering of engineers from every country and state in the world gathers next week for sessions that have been discussed widely in all branches of engineering. The programs will continue daily from October 29 to November 7.

The object of the World Engineering Congress is to effect an international exchange of the latest knowledge of the sciences and practices of engineering and to bring together the leaders in research, education and business who are directing the trend of engineering activities, thereby initiating and promoting international cooperation and understanding of engineers of the world.

Feldspar Grinders Hold Well-Attended Meet at Atlantic City

At a recent meeting of the officers and directors of the Feldspar Grinders' Institute, Herrold Thropp, of the Eureka Flint and Spar Company, Trenton, N. J., was made a vice-president of the institute.

A general meeting of this newly-formed institute was held September 20 and 21 at Atlantic City, N. J. There was a record attendance at this meeting, several representatives of each member firm being present. Most of the business sessions were devoted to listening to and acting upon the various committee reports. Since the date of the last meeting, the various committee chairmen have been active, trying to solve the many problems confronting the industry.

Herrold Thropp, vice-president Feldspar Grinders Institute

B. C. Burgess of the Tennessee Mineral Products Corporation and chairman of the classification and standards committee gave a summary of the various meetings of his committee. The report of this committee was adopted as presented. However, certain changes are contemplated before this report will be given publicity.

H. P. Margerum of the Consolidated Feldspar Corporation, chairman of the tariff committee in cooperation with the ceramic industry; V. V. Kelsey, chairman of the transportation committee, and Richard Wainford of the Trenton, Flint & Spar Company, chairman of the truck delivery committee, all gave reports of their committee work.

Considerable time was given to the work of the package committee of which C. H. Peddrick, Jr., of the United Feldspar Corporation is chairman. Mr. Peddrick's committee recommended the use of paper bags for shipping feldspar in the future.

H. G. McLear, of the Green Hill Mining Company and chairman of the code of ethics committee, presented a Code of Ethics for adoption which was accepted unanimously and signed by every member present. This was considered one of the most important steps of the institute since its organization and is given in full as follows:

Code of Ethics

1. Indirect or underhand selling or buying methods intended to influence anyone improperly is prohibited.
2. The making or circulating of false or misleading statements, either written or oral, respecting a competitor's product, service, or selling price or regarding his business, financial or personal standard is prohibited.
3. No over-statement or misrepresentation shall be made.
4. No order larger than can reasonably be delivered within the terms of the agreement shall be accepted.
5. Discrimination in prices between different purchasers or different localities based upon other than legitimate differences in costs is prohibited.
6. No attempt shall be made to persuade a customer to break a contract with a competitor.
7. No offer of employment to a competitor's employees shall be made unless, without solicitation, they ask for employment.
8. Material shall not be sold at or below cost for the purpose of annoying, harassing or eliminating a competitor, or otherwise.
9. The permanent rendering of any unusual service or giving of terms greatly exceeding the usual trade practice is prohibited.
10. The buying of business by the payment of a commission or bonus to persons not in the seller's employ is prohibited.
11. Only such samples of products as are made from stock materials shall be submitted for the consideration of prospective customers.
12. No competitor's samples shall be used for the purpose of disparaging the quality of his product.
13. No special discounts nor rebates shall be allowed which are not reported as part of the price, and the purchaser shall be charged for the actual grade and grinding of the material shipped.
14. Dealers, salesmen and agents shall be provided with this Code and as far as possible they shall be induced to conform with it.

On Saturday evening, September 21, a banquet was held at the Ambassador Hotel, at which time Hon. M. Markham Flannery of the Federal Trade Commission gave a very interesting talk on trade practice conferences.

The next meeting of the Feldspar Grinders' Institute is scheduled for November, the exact time and place to be announced.

Wolverine Portland Cement Company Dedicates Trophy Awarded by Association

OWING to a downpour of rain the exercises pertinent to the dedication of the safety trophy awarded by the Portland Cement Association to the Wolverine Portland Cement Company's plant at Quincy, Mich., were held in one of the mill buildings. The affair was well attended by the mill employees, their families and their friends, in spite of the inclement weather.

Those in charge of the exercises had arranged a very attractive scheme of fall decorations which, unfortunately, were not very noticeable in the misty rain.

The meeting was called to order by W. F. Murray, general superintendent of the Wolverine company, who took the opportunity to congratulate the mill force on the honor which they had brought to the plant and for their efforts in the humane work of safety. A telegram of congratulations from J. B. Johns, chairman, accident prevention and insurance bureau of the Portland Cement Association, was read.

L. A. Hutchins, chief chemist, took charge of the exercises in a very able manner which bespoke considerable previous experience. The music was furnished by the Quincy-Coldwater band under the direction of F. E. Marsh, former chief clerk of the Quincy plant.

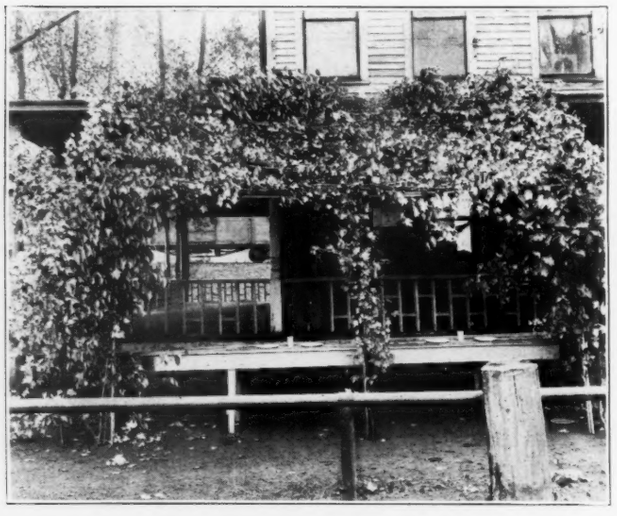
A. J. R. Curtis, assistant to the general manager of the Portland Cement Association, formally presented the trophy. He aptly referred to the safety trophy as a monument not to the dead but to the living, placed not in a city of the dead but in a sphere of human activity. His complete address follows:

Mr. Chairman, Workers at the Quincy plant, and Friends:

About two years ago I had the pleasant opportunity of meeting with the safety committee here at your mill and, on that occasion, as I recall it, we talked about preventing accidents and then, at some length, of the Portland Cement Association trophy and the happy celebration which would bring us together again, should your organization succeed in its determination to complete a year without injury to a workman.

You have demonstrated, since we were together at that meeting, that intelligent training, eagerness to cooperate with one another for the attainment of a common objective and a brotherly regard for the welfare of fellow workers are the most de-

Absence of people in this view of the trophy and speaker's stand was due to rain that prevented outdoor exercises



This refreshment stand was not in much demand due to the inclement weather

pendale preventatives for accidents. Therefore, I congratulate you all most sincerely on the wonderful showing that has been made.

Those who are acquainted with even a few of the hazards with which men are confronted in the manufacture of cement will marvel that any mill organization could have made so fine a record. Only a short time ago it was conceded that a mill had to have accidents and many of them. But you have accomplished that which seemed impossible and, thereby, brought to your plant the most distinguished honor which our industry has to bestow.

Your representatives, Messrs. Dieterman and Rice, received the formal award of the trophy for you at New York on May 21. Therefore it is my privilege, acting on authority of the Board of Directors and on behalf of the members of the Portland Cement Association throughout America, to turn over to you the Portland Cement Association safety trophy for 1928 and, with it, congratulations and best wishes to every member of your organization who has contributed to your splendid record. In presenting you with this trophy it is the hope of the Association that you may repeat this splendid record often during years to come.

The concrete monument which we are dedicating here today is unique in that it is erected in honor of the living, rather than the departed. It symbolizes achievement, rather than bereavement. It stands here overlooking this great plant, throbbing with productive activity, in happy contrast with the sombre setting of monuments which stand in the silent cities of the dead. Rather than a token of work laid down, it expresses acknowledgment of a work well begun.

The need for safe thinking is perpetual and no season, month, day or instant is free from the possibility of injury unless every man in your organization is constantly on the alert. We sincerely hope that this monument, bearing new inscriptions commemorating future perfect records, will serve as a constant inspiration and reminder.

John Dieterman, superintendent of the Quincy plant, accepted the trophy in a few well-chosen words.

Hon. W. G. Cowell, a director of the Wolverine Company, made the speech of the day, paying a high tribute to cooperation which made possible a perfect safety record for 1928.

The first aid team from the plant gave two exhibitions in a very capable manner. This team was closely followed by an alleged first aid team who worked very efficiently on an injured man (a dummy) having hurriedly seized a set of millwright tools, instead of the first aid kit.

Following a band concert, refreshments were served to guests and employees.

'Ten-Shun Stone Crackers!

The above is the headline of an announcement issued by the secretary of the New York Crushed Stone Association which reads as follows:

Turn on the air hose and blow the stone dust out of your hair. Rub some crusher grease on your shoes and hit the rattler for

L'i'l Ol' N'York

THE BIG SHOT OF THE YEAR will be pulled off at the meeting of the New York Crushed Stone Assn., at the Hotel Pennsylvania, New York City, Friday, October 25th.

Business meetings will be called at 11 a.m.

Luncheon at 12:30 p.m.

Dinner meeting as guests of the Manufacturers Division of the National Crushed Stone Assn. in the evening at Hotel Pennsylvania.

You all remember that last year's New York meeting was the best one of the year in attendance and interest, and the one this year will be just as good.

No excuses are accepted for non-attendance at this meeting so sell an extra car of stone, put the money in your pocket and beat it for the bright lights.

See you in the big city,

New York State Crushed Stone Association,
A. S. Owens, Secretary.

"Andaste" Jury Reports

The verdict of the coroner's jury in the case of the sinking of the gravel-carrying lake boat, *Andaste*, on September 9 (see page 103, PIT AND QUARRY, September 25), absolves the Construction Materials Company, owners, of any responsibility for the tragedy. The jury, composed of Holland, Mich., business men, found, also, that the Coast Guard and other agencies did all that was possible in the circumstances.

Ottawa Silica Company Produces Various Grades For Nearly Thirty Industries

By E. J. PATTON

HOW many people realize that the production of pure silica sand is an industry in itself —that it is mined as sandstone, broken up, carefully washed, sized, vacuum cleaned and the different sizes sold as basic products for many different industries.

We can parallel Shakespeare's seven ages with the uses for silica sand. It is used in the bottles and dishes used from infancy to old age. The plate glass windshields of the camouflaged collegiate flivver and the regal Rolls-Royce are made of silica sand. The housewife finds a dozen uses for cleaning compounds and polishes made from ground silica sand. The roof of the manufacturer's plant is surfaced with the material.

We find that practically all of the steel castings used are moulded in silica sand and the rough edges smoothed off with the same material. The cut stone used to face our most beautiful buildings is sawed to the architect's specification by means of silica sand and steel bands. There are dozens of other uses, but perhaps the last is the silica sand used in the sand blast which etches and carves our tombstones.

Although silica sand is one of the most common of the mineral substances there are relatively few locations in this country where it is found in a pure state. For years, a large proportion of our silica was imported from Belgium. Although a certain amount is still imported there are several good deposits scattered all the way from the Atlantic coast to California.

One of the best deposits in the middle west is that located near Ottawa, Illinois, about eighty miles southwest of Chicago. The silica is found in the form of St. Peter sandstone, a white rock made of loosely bonded silica grains. At one time the deposit was evidently a series of sand dunes about the shores of some prehistoric lake. Later the sand was buried and loosely bonded into a friable rock.

Shovel removing overburden

The Ottawa deposit is from one hundred to two hundred and seventy-five feet deep and now lies very close to the surface, where very little surface stripping is necessary.

In 1928 the Ottawa Silica Company purchased the United States Silica Company, thus uniting under one management two of the leading producers in the country. Three mills, A, B and C, all located within a short distance of each other, are operated both day and night the year around.

The three mills are practically alike in operation and capacity and a description of mill A will suffice to show the process used to produce a daily output of eighteen hundred tons of silica sand which analyzes 99.89 per cent pure SiO_2.

To the average person, sand is sand, but to Wayne Gyger, superintendent of the mill, sand is a product which must be prepared with the greatest attention to every detail. At the pit, the overburden of earth and clay is removed by a 1⅞-cu. yd. P. & H. gasoline shovel, trucked away and the surface of the sandstone carefully swept with hand brooms and an air hose. When the deposit is perfectly clean, deep holes six to eight feet apart are drilled by Ingersoll-Rand jackhamers in rows eighty to one hundred feet back from the quarry's face. Compressed air is supplied by Ingersoll-Rand compressors.

An interesting method of blasting has been developed which is most effective in breaking down the rock into sand. In addition to the vertical holes, horizontal holes are bored about twenty-five feet into the foot of the face to be blasted. These

Men keep pebbles and lumps from entering pulsometer pumps in pits

This product is used in making test blocks with portland cement

are loaded with du Pont dynamite and all but one fired with a time fuse. One is fired electrically and its early explosion loosens material which falls over the other holes. This loose material gives a tamping action that helps confine the succeeding explosions and results in a surprising disintegration of the sandstone.

After blasting, the stone is reduced still further by streams of water under one hundred to one hundred and fifty pounds pressure. The loosened sand is washed down to a sump where a home-made large pulsometer steam pump force the sand and water through pipe lines to the mill nearly a thousand feet away. During this long stretch of rolling and tumbling, foreign matter is loosened and the sand gets its first washing.

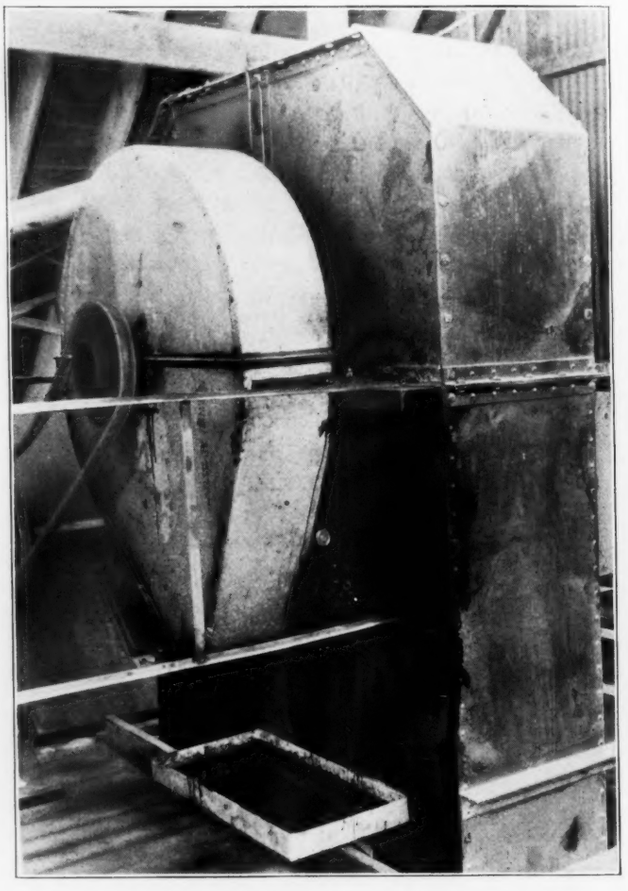
The pit crews operate only one shift a day, but during this time mine enough sand to keep the mill functioning on a twenty-four hour schedule. From the receiving sump at the mill the sand is again washed and dewatered as it is elevated by a special drag conveyor. This conveyor is essentially an eighteen inch belt conveyor with renewable wooden flights or "half soles" on the under side of belt to push the sand up a steep wood trough.

At the head end, sand is discharged into a Stephens-Adamson revolving screen which rejects the pebbles and foreign matter. Strong jets of water play over the screen and continue the washing process. Water for the mill is supplied by an American centrifugal pump of 600-gal. per min. capacity from an artesian well over one thousand feet deep.

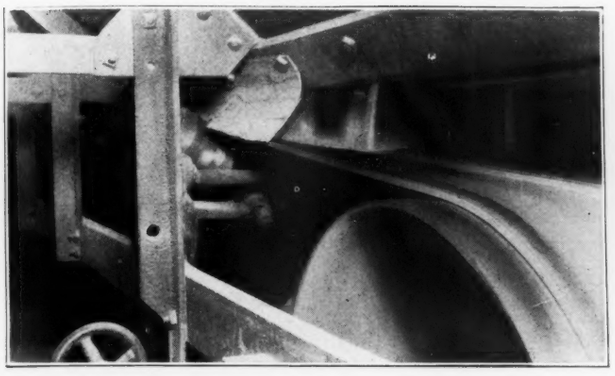
As the sand passes the fine mesh of the screen it is sluiced into two washing bins where the majority of the soluble material and fine dust is removed. When one bin fills, its content is pumped to a similar set of washers below while the alternate bin is filling.

After the sand has passed through two such washing processes it is again pumped to one of four draining bins, each of nine hundred tons capacity. Here the final washing is completed by sprays and water jets. The sand is then drained until it contains less than 5 per cent moisture and transferred, by a 5-ton P. & H. traveling crane and clam shell bucket, to any of the six dryers located alone one side of the draining bins.

The dryers are long hoppers filled with steam pipes. The sand arches over the pipes until all the moisture is removed. The dry sand gradually



Elevator from washing and drying bins to screening department



Conveyor receiving dried sand for sizing mill

Mill A, near Ottawa. Pipes at right are steam lines to mill B and the pit

settles between the pipes and is collected on a long Stephens-Adamson belt conveyor.

The heat surrounding this conveyor is intense and the carriers are subjected to a constant spray of sharp silica sand which is later to be used for sand blasting. Considering the operating conditions, it seems almost remarkable that the conveyor should perform as perfectly as it does.

A Stephens-Adamson bucket elevator carries the sand up to the mill where it is carefully sized on Tyler vibrating screens. Even though the sand has been thorougly washed it is subjected to a vacuum cleaning process as it passes over each screen. As a result, when the various grades drop into their respective storage bins the sand is dazzlingly white and literally clean enough to eat.

From the storage bins, the sand is loaded into box cars, which have been previously cleaned and lined with paper, and shipped to practically all parts of the country.

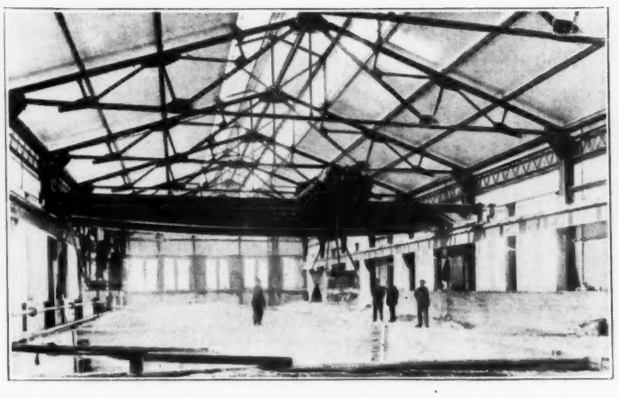
Eight commercial grades of silica sand are produced—ranging from the finest reground silica up to the twenty-thirty mesh "Standard Sand" used in testing laboratories.

1. Silica—the finest size, reground to a powder and used for surfacing artificial marble, for stucco, for glazing pottery, for silica wash in foundries and last but not least, for the scouring agent in various popular household cleaning compounds and polishes.
2. Banding sand—a fine mesh sand for glass etching, sand blasting and coating some grades of roofing paper.
3. Crystal silica and even-melt sand—one of the main ingredients in making high-grade plate glass.
4. Foundry sand—for facing moulds.
5. Diamond sand—for average sand blast use.
6. Flint shot—for sand blast.
7. Sawing sand—a coarse sharp sand used with steel blades to saw Bedford stone into required shapes and sizes.
8. Standard sand—a twenty-thirty mesh sand which is the aristocrat of silica sands and is used by engineers for its absolutely uniform size and purity for testing the strength of various Portland cements in important concrete work.

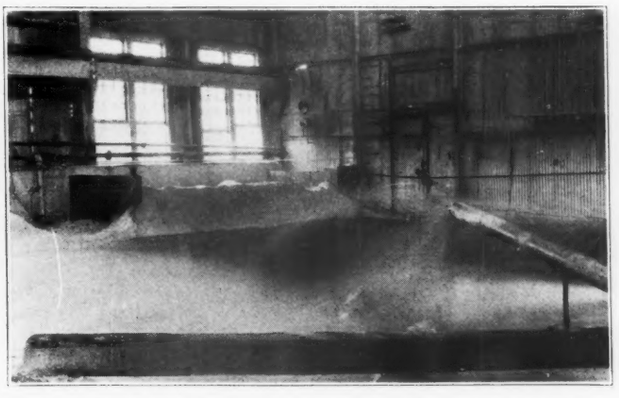
Not content with the usual screening, Wayne Gyger, Supt. of Mill A, maintains a separate department for the preparation and inspection of "Standard Sand." Only fifty bags are produced per day, but the product is guaranteed to be absolutely uniform in size and properties.

From the mill the "standard" stock is spouted to a separate building where it is run through special gyratory riddles. The sand passing twenty-mesh is put on thirty-mesh screens and the sand which will not pass the thirty-mesh is then passed through a machine which removes every particle of foreign matter. The result is the "Standard Sand" which is specified by the American Society for Testing Materials for making tests on Portland cement.

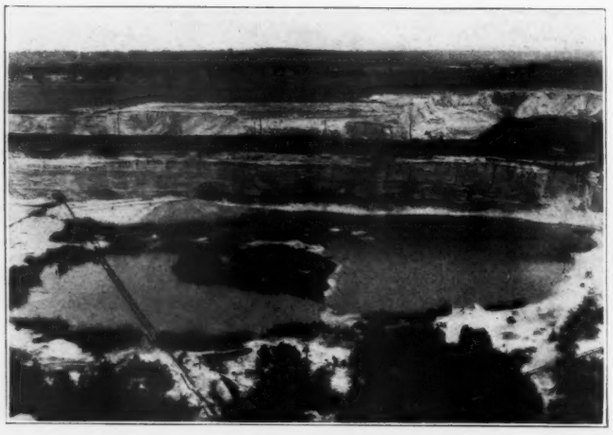
Mills B and C of the Ottawa Silica Company are very much like mill A in layout and capacity and



Overhead traveling crane



Bins for final washing. After washing is complete, sand is transferred, by crane, to the dryer hoppers at the rear



Note stripped area beyond this pit for mills A and B

each produces approximately eighteen hundred tons of silica sand per day. J. B. Herring is executive chairman, E. B. Thornton is president, H. C. Thornton is vice-president, P. S. McDougal is general manager, Joseph Gyger is general superintendent, and Wayne Gyger is the superintendent in charge of Mill A at the Ottawa, Illinois, plant.

Why Do Bearings Get Hot?

By W. F. Schaphorst

It is commonly thought that bearings heat because of insufficient lubrication. To be sure, lack of lubricant is a bad thing, and will invariably cause heat, but that is not *always* the cause of heating. Let us step back a short distance and take a look at lubricants and lubricating from other angles.

I have known of many instances where lubricants have been purchased because of low price. High pressure salesmen, in their endeavor to make a sale, will glibly say: "Our oil is as good as.... and it costs only one-half as much." And the sale is made. To the sorrow of the purchaser he soon discovers that his bearings run hot and much money is lost in the shape of power required to overcome the additional friction, plus the cost of the more rapid wear of the machine parts.

For example, I have in mind an oil that costs twice as much as any other oil sold for the same purpose, yet the more expensive oil, as regards first cost will last three or four times as long as cheaper oils. The high grade oil requires less power, and of course with reduced friction there is less wear and tear on the machinery. Money is saved all around. So you see, mere *quantity* isn't always so important after all.

Clearance is very important. If the clearance in the bearing is either too large or too small the bearing will heat. When clearance is too large there is greater pressure per square inch between the metal parts that make contact or that "almost" make contact, and as a result heating will occur. The shaft that is too small is more liable to cut through the oil film because of this greater pressure. As soon as the film is cut, and we have true metal-to-metal contact, wear becomes very rapid and a "hot box" may result.

On the other hand if clearance is too small the bearing will "bind." If the fit is so close that room for lubricant does not exist it is clear that friction will be great. Then, the greater the friction the greater the heating. With rise in temperature the shaft "swells." Friction may increase until the shaft won't turn at all, regardless of the driving power.

Next comes alignment. If we have several rigid bearings in a row with a shaft through them, and if the bearings are not in perfect alignment, the shaft will surely press more intensely against the edges of the bearings than elsewhere. The lubricating film will very likely be broken, and heating will result. Even if the bearings are self-aligning there will be greater pressure between the shaft and bearings than where alignment is correct. Whether the bearings are plain, ball, roller, rigid, or self-aligning, and regardless of the lubricant used, they should always be in true alignment.

And then there is dirt. Everybody knows, or should know, that regardless of the kind of oil used, bearings must always be kept clean. The highest priced oil obtainable in the world will not and cannot offset the harm that will be done by dirt. Be sure that the oil applied to any machine is perfectly clean and free from foreign matter, especially grit.

American Headquarters of the World Power Conference

The engineering profession and the power developing and using industries of the United States are planning an elaborate papers program for discussion in the sessions of the World Power Conference to be held in Berlin, June 16-25, 1930.

The papers program will stress the economic and financial problems involved in the generation, distribution and utilization of power, and focus the attention of the world upon the increasing importance of this tremendous agency in building up of civilization.

The American Committee is formulating the program which will be closed on October 21st. It is expected that General Reports of all the papers will be available in French, German and English, well in advance of the Congress.

The address of the World Power Conference Program Committee is Room 818, 29 West 39th Street, New York, N. Y.

Diesel Engines — Their Present and Possible Applications in the Pit and Quarry Industries—III

Discussing, Describing and Illustrating Practical Applications of Oil Engines and Pointing to Opportunities for Saving by the Use of This Power

By J. O. DURKEE

IN THE first and second sections of this series of articles, published September 11 and October 9, 1929, an effort was made to describe a number of different classes of engines, discuss diesel applications to central power plants, and point out the advantages of diesel-operated stone plants. A section on hydraulic dredges was included and instances of diesel-powered towboats were cited. These different fields were covered with the anticipation that the industries will study those concrete examples and receive some assistance in comparative costs from these discussions.

As in the second section of the series, this installment is not circumscribed by the boundaries of the field covered by PIT AND QUARRY. Where an illustration of the accomplishments in a closely allied field is believed to be of interest to the reader, it has been incorporated to illustrate the point in hand. Engineers, operators and equipment manufacturers were consulted and publications have been searched to assure our readers of a clear unbiased discussion and illustration of facts as they are found to exist and point the way to possibilities where such information is not available.

Excavating Machinery

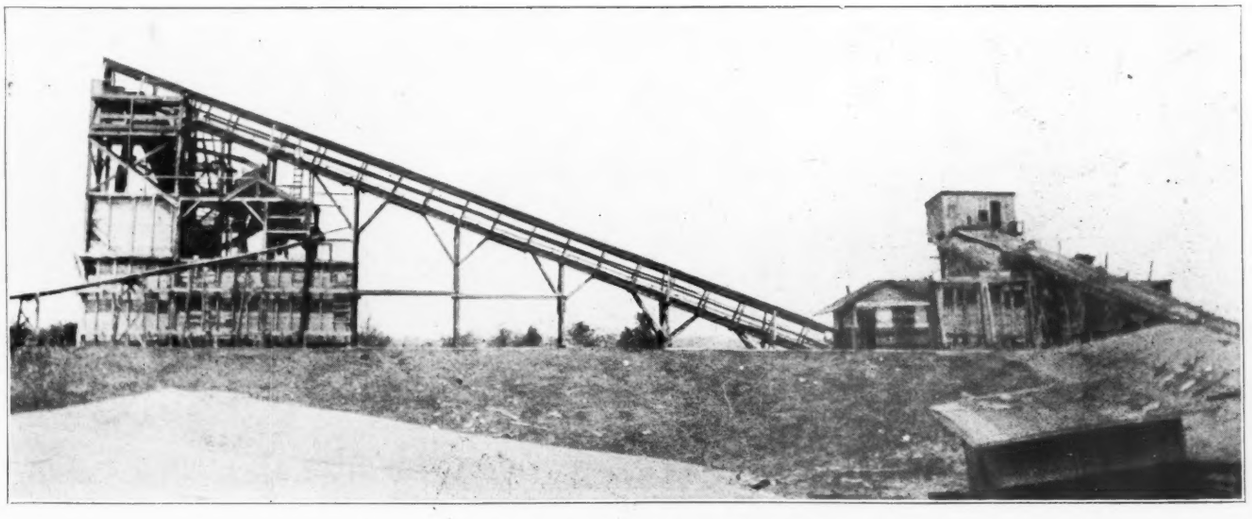
Thirty years ago, it would have required the imagination of a Jules Verne to visualize all the present types of excavating machines. Then, the maximum weight of excavators was 50 tons, while today 1,200-ton machines are common. Steam was then the only motive power, while now excavators are powered by almost any of the innumerable systems including steam, gasoline, gas, petrol, petrol paraffin, electric and heavy oil, together with many different combinations, such as gas-air, diesel-electric, and other arrangements for transmitting power to these machines. With reference to this class of equipment, we are especially concerned with the application of diesel engines to excavating machinery.

"W. W. Fischer" operated by Fairbanks-Morse engine

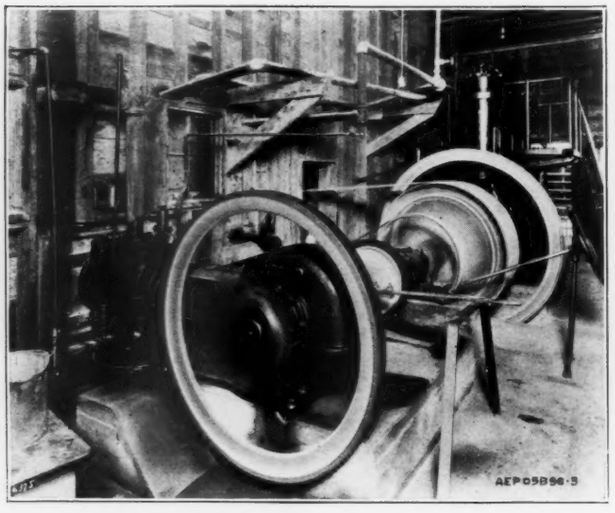
For description, see page 70, October 9 PIT AND QUARRY

Quoting further from the article by C. H. Gibbons:

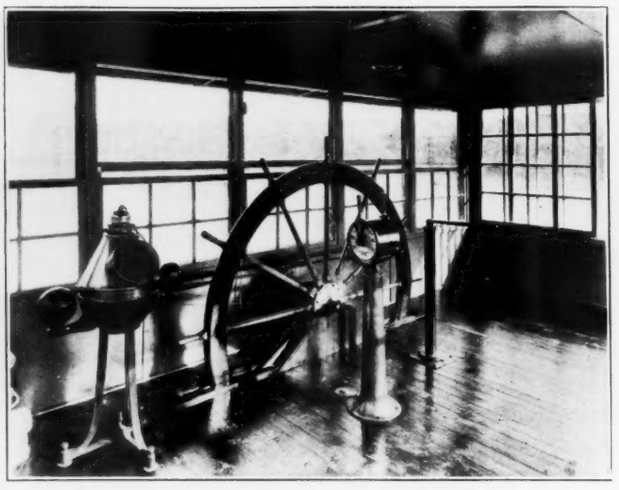
"There are three methods in general use for transforming the power of the diesel into useful work at the bucket tooth. One of these is by the use of direct mechanical drives through chains and gears, reversal of the motions being effected by means of clutches and overloads being cared for



Plant of Tennessee-Arkansas Gravel Co.



The 180-hp. Fairbanks-Morse diesel that not only drives the crusher, an 84-ft. elevator and screen, but is also direct-connected to a 10-in. by 11-in. Sullivan air compressor in the Byers plant

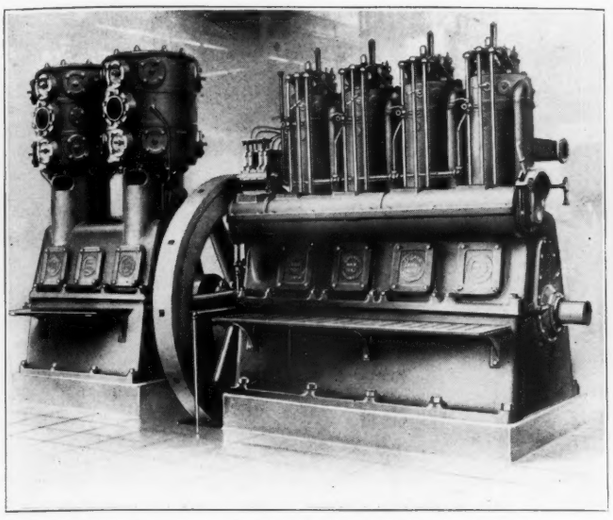


Pilot house in "W. W. Fischer," showing twin telegraph control

through slippage of the latter. A second method involves the combination of the diesel, an air compressor, and a mechanical drive to one of the three major motions necessary to power-shovel service, namely, hoist, swing, and crowd. The air compressor supplies air to the storage tanks. From these it passes through a heater and has its temperature raised to about 400 deg. fahr. by the exhaust gases from the diesel, and thence to the engine used for turning the rotating frame about a vertical axis, known as the swing or rotating engine, and to the engine used for forcing the bucket into the material being excavated, known as the crowd or thrust engine. The motion which lifts the bucket up through the material and fills it is the hoist motion, and this is chain driven direct from the diesel crankshaft.

"The third method direct-connects a direct-current generator to the diesel and by means of differentially wound generator fields and other specially devised control circuits secures from the associated motors speed-torque characteristics closely approximating the steam-engine speed-torque characteristic except at very low speeds, where the torque of the diesel-electric combination is decidedly better than that of the steam engine. Here

Byers Crushed Rock Company plant, Kansas City, Mo., produces 700 cu. yd. per month with diesel power and uses five trucks for distributing to the trade

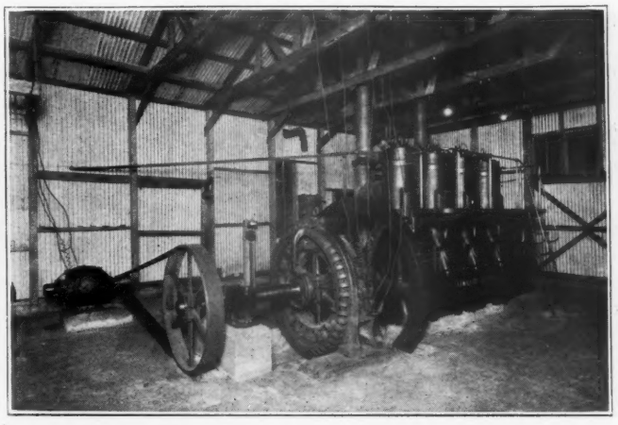


CP 120-hp. diesel engine direct-connected to a CP vertical compressor. Unit made by the Chicago Pneumatic Tool Co.

there are three d-c. motors, usually series-wound in the sizes under consideration, one each for the hoist, swing, and crowd motions. Vertical-handle controllers mounted in the same relative positions as and operated in much the same way as steam-excavator levers make handling both simple and easy of learning by the operator.

"From the standpoint of operating characteristics, steam has always been and still is the ideal to which excavating-machine designers look. The quality most uniformly commended is the ability of the ungoverned, throttle-controlled steam engine to give a uniformly rising torque with decreased speed—the "tugging" trait, the ability to pry out obstructions. A glance at the graph on page 61, October 9 issue of PIT AND QUARRY will reveal how far from the ideal the carburetor engine is and how much better the diesel is—the torque increase at lower speed being nearly 30 per cent for the same size of engine. Also a lower final speed (before installing) may be availed of with the diesel.

"A further study of the graph will also show the manner in which the shovel designer has availed himself of the fine torque characteristic of the high-speed diesel in combination with the added flexibility in design of the electrical transmission to effect a speed-torque characteristic very closely approaching the ideal steam characteristic. For in power-excavator service, through a part of the speed range the importance of power is predominant, but through another portion torque governs. The designer must in some way meet both of these requirements

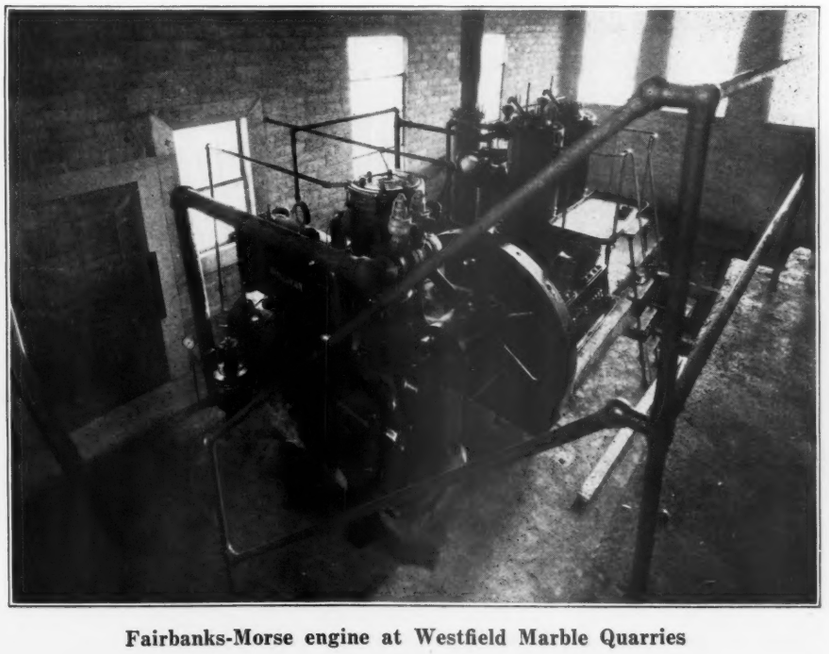


This 250-hp. Fairbanks-Morse engine furnishes power at the Beaumont Building Materials plant for 275 hp. in electric motors

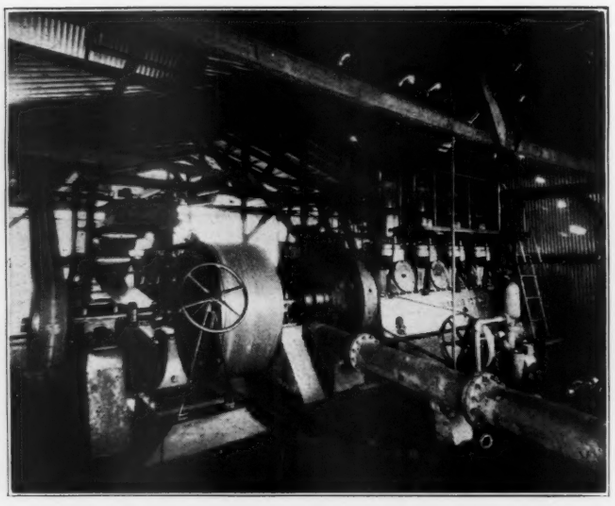
in order to make an excavator which will be profitable in service, and therefore satisfactory to the purchaser.

"Fuel costs of less than a cent per cubic yard have been found to be common on diesel-powered excavators by a prominent company building this class of equipment. Since the gas engine 'breaks' at about 50 per cent normal speed, while the diesel 'hangs on' to about 30 per cent, outputs are about 10 to 15 per cent higher with the diesel than with the gas engine. The fuel is about half in quantity, and the fuel costs are therefore from ⅛ to 1/10, as the price variation per unit is 4 or 5. An estimate of costs recently published by this company, shows for a 1-cu. yd. machine in a 200-day operating year a saving of $2,230 over a gasoline-operated machine of the same size, interest and depreciation being properly accounted for."

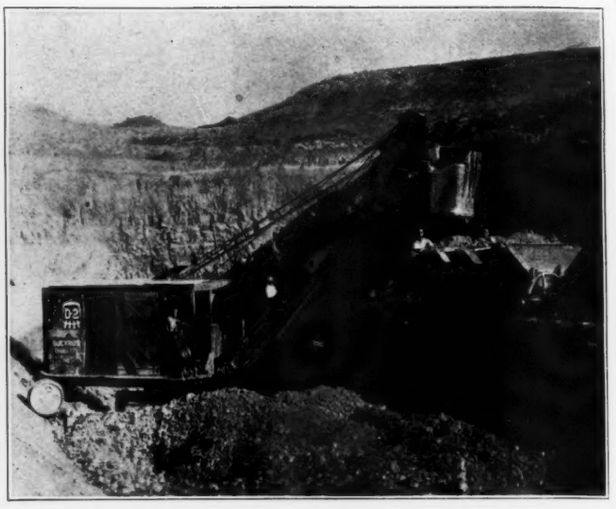
According to F. Salditt of the general sales department for the Harnischfeger Sales Corporation



Fairbanks-Morse engine at Westfield Marble Quarries



A 240-hp. Fairbanks-Morse engine driving a 10-in. Amsco pump for Rapides Gravel Company



Bucyrus D-2 speeding up operation and cutting fuel costs for a contractor in Spain

in the January issue of *Oil Engine Power*, the Harnischfeger Corporation has obtained particularly satisfactory results with diesel engines manufactured by the Buda Company and the Atlas Imperial Diesel Engine Company. It has found that the use of diesel engines increases the performance of machines of a given size, while the unparalleled low fuel cost and modest maintenance expense of the diesel engine are advantages of far-reaching economic significance.

Three factors are mainly responsible for the superiority of the diesel engine and its ability to deliver yardage with economy: The diesel engine is inherently more efficient because of the higher compression and fuel combustion system with which it operates; the economy of the diesel engine is not noticeably impaired by operation at fractional power, low speed and high torque; the high torque of the diesel engine enables it to keep operating steadily under heavy momentary overloads. The yardage and output of the diesel excavator is, therefore, practically constant irrespective of variations in the resistance of the material to be moved.

The Bucyrus-Erie Company is featuring its D-2, 1-cu. yd. and E-2, 2-cu. yd. diesel-operated shovels, which are easily convertible into draglines, cranes, clamshells or drag shovels. These machines have passed the experimental stage, as it is claimed by the manufacturer that the first diesel-driven excavating machine was a Bucyrus product, introduced in 1922. Since that time, its engineers have accumulated a fund of valuable experience in diesel shovel and dragline operations.

The engine for operating the D-2 is a Bucyrus-Erie Atlas, a most economical power unit, which is its outstanding feature. It is a 4-cycle, 4-cylinder engine, with 6½-in. bore and 8½-in. stroke. Its speed is 550 r.p.m. This engine delivers the greater power that means constant delivery of low cost yardage. The fuel is fed into it mechanically, providing a high economy of fuel consumption.

In addition to the greater fuel economy of the full diesel compared with either the semi-diesel or gasoline engine, it can be started stone cold and is ready to dig in twenty seconds. No priming and preheating is necessary; in starting, the engine is rotated by air from a reservoir, and, with the open-

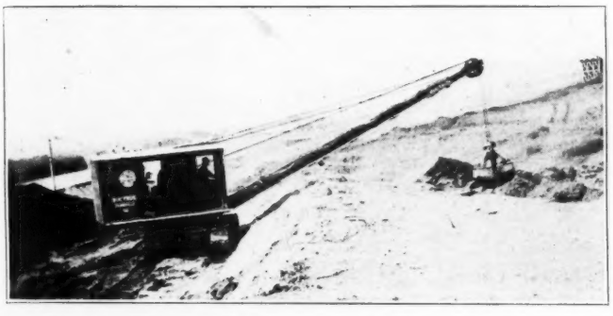
Diesel-driven Bucyrus 50-B in a gravel pit

Bucyrus diesel-driven 50-B excavating rock at Finks Siding, Cal., for the Orange County Rock Company

ing of a fuel valve, it delivers its full power at once.

The engine is mounted on a raised base which is bolted securely to the revolving frame. This type of mounting provides a direct connection between the machinery and engine, and insures a perfect alignment at all times.

The E-2 or 1¼-cu. yd. machine, powered by a Bucyrus-Erie Atlas diesel engine was designed and built especially for excavating work where a greater working range and dipper capacity is required than is offered by the D-2 shovel. It is a 4-cylinder engine, with 7½-in. bore and 10½-in. stroke. It has a normal speed of 425 r.p.m., providing a great factor of safety against wear, combined with greater power for digging big yardages per day. It is a simple, time-tried engine that has long withstood the most strenuous tests of peak loads and continuous work. This means that the shovel owner does not put his money in an experimental machine. He is assured of constant low cost service. This slow-speed engine, with an extra large crankshaft and liberal bearing areas, makes possible continuous operation and long life.



The diesel-driven D-2 in the plant of Santa Cruz Portland Cement Company

The engine speed is controlled by a mechanical governor that has proved to be a big fuel saver. This governor feeds the engine ample fuel for peak loads and reduces the flow for smaller loads. In other words, increased power is behind every hoist, swing and thrust motion when you actually need it.

This shovel is economically convertible into a dragline, clamshell, crane, pile driver or sewer shovel. Not a single change in the main machinery is necessary beyond the removal of lagging from the main drum, and the addition of an air clutch for the hoist in changing from a shovel to a dragline.

The Link-Belt Company manufactures a number of different types of diesel-operated crawlers, cranes, shovels and draglines that are used in the pit and quarry industries. Among the latest is the K-55 which is a powerful, heavy-duty, all-purpose, 2-yd. machine, primarily designed for the following adaptations:

Shovel with 30-ft. boom and 18-ft. dipper stick

Combining fuel economy with low repair cost, this diesel-driven D-2 clamshell is used for material-handling and full-time operation in the Santa Cruz plant

carrying a 2-yd. struck-measure-capacity all-manganese-steel dipper.

Dragline to handle 2-yd. dragline bucket, for medium and medium-heavy excavating, on boom 50-ft. long; or a 1½-yd. dragline bucket on boom 60 ft. long.

Clamshell bucket of 2-yd. capacity, for sand, gravel or materials of equal weight per cubic foot, and consistency, on boom 50 ft. long; or a 1½-yd. bucket, in such materials on boom 60 ft. long; or, of course, an equivalent weight of loaded bucket in heavier or lighter materials.

Trench shovel, 2-yd. capacity.

All attachments are interchangeable without removing or disturbing the mechanism of the machine proper.

There is a large field for the K-55 in quarries; large sand and gravel operations; on unloading docks; in drainage work; and many other places where large production is required.

Incidentally, this is claimed to be the only machine of, or near, its capacity which does not require extensive dismantling and preparation for

Diesel-driven shovel stripping overburden

Diesel-driven Link-Belt crawler excavating in sand pit for the McNamara Company, Boston, Mass.

shipment. The K-55 has a collapsible mast, and special shipping treads which may be quickly and easily substituted for the working treads, to bring the machine within the railroad clearance requirements of 10-ft. 4-in. overall width and 16-ft. 0-in. overall height above top of rail when loaded on flat car.

Besides the unit cast steel construction of lower and upper frames, self-cleaning crawler treads and large bronze-bushed crawler rollers, enclosed cut gearing and bronze-bushing bearings throughout—features which Link-Belt has pioneered since it first began to build crawlers, other details of construction which are outstanding and indicative of the caliber of the new machine, include:

Internal expanding friction clutches of unusual size and power, the main drum clutches being 42-in. diam.; and swing and travel clutches, 30-in. diam.

A 13½-in. diam. center pin, adjustable from above, which can be removed as a unit with the vertical travel shaft assembly, without removing any other parts.

Large drums with renewable cast steel shells,

Marion shovel, equipped with Fulton-Foos engine

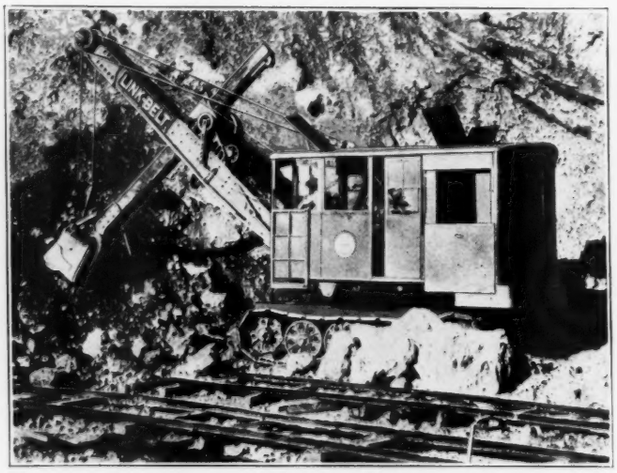
having air space between clutch and brake surfaces, for rapid cooling; and large, powerful drum brakes, 48-in. diam. by 5-in. width.

The machine in working condition is 12 ft. wide overall at the lower frame, which gives it ample stability for the work for which it is designed. Crawler treads are 36 in. wide.

The Link-Belt Company is using Atlas-Imperial diesel engines on the 2-yd. crawler cranes and draglines. According to the Link-Belt engineers, this type engine has so far been the most satisfactory for this type of machine.

Diesel-power excavating equipment is playing an important part in the huge levee construction program which is now in progress along the Mississippi river. Parenthetically, the following is used to show that if diesel power is so successful in large enterprises, it must, in the same relation, improve excavating in pits and quarries.

This is the largest dirt-moving enterprise ever undertaken, involving not only a larger expenditure but also a greater amount of dirt-moving than was required in digging the Panama Canal. However, construction machinery as a whole has been



Diesel-driven Link-Belt K-35 loading blasted limestone into quarry cars

greatly improved upon since the time of digging the canal and the contractors who bid in this levee work will not feel the lack of dependable, adequate excavating equipment. Most of them are choosing diesel-powered units. Harnischfeger Corporation reports that several of the largest levee contractors now at work along the river have added new P & H diesel-powered machines to their fleets during the past year, and that work is getting well under way.

Shortly after the 1927 flood disaster the Mississippi River Commission made a survey of conditions along the river and reported that $684,000,000 would be required to raise the levees and strengthen former flood by-passes sufficiently to provide proper control of the Mississippi. The Government appropriated $325,000,000 with which to start the work.

It is difficult even to form a mental picture of the problem facing engineers who are in charge of the levee construction work. Stating it in a simple comprehensive way—the aim behind the project is to provide a means of passing the maximum run-off of the Mississippi and its five principal tributaries through a channel approximately 1,000 miles in length. This appears like a simple task but upon studying the accompanying map it will be appreciated that an enormous amount of work is planned. A large portion of the new levee will be built several hundred feet farther back from the river bed than the old one was. This renders it practically impossible to drag material from the old levee into the new one. It is also impossible, in many cases, to secure sufficient material close by to permit of building new levees to the required height and width. For these reasons the task, in many places, consists of excavating dirt from borrow pits, hauling it to the levee, and dragging it into place.

P & H Model 700 1¼-cu. yd. capacity, powered by 7½-in. by 10½-in. Atlas-Imperial engine

Diesel-powered P & H machine loading truck

While numerous methods have been tried for conveying dirt to the levee, dump wagons and rail cars have proved to be the most practical. In some places it is necessary to haul the material as far as 1,000 ft. After the fill is dumped at the base of the levee another dragline completes the cycle by actually placing the material. The average height of the new levee will range from 22 to 28 ft. The increased volume—made available by increasing the height and spreading the levees farther apart—will unquestionably confine all except the most abnormal flood waters for all time to come.

Contractors who have thus far been awarded levee construction work along the Mississippi are selecting diesel-powered machines with which to handle the excavating in the most economical manner. The A. C. Nielsen Company, a staff of impartial engineers, conducted an investigation in connection with the performance of a 1¼-cu. yd. diesel-powered Harnischfeger dragline on April 26 of this year. The results of the survey, expounded in the following paragraphs, clearly point out some of the sources of saving with diesel power. The levee construction work studied by the engineers was handled by the Howard Kenyon Dredging Company. The machine was a Model 700 dragline of 1¼-cu. yd. capacity—powered by a 7½ by 10½ Atlas diesel engine. The job investigated involved the moving of 178,592 yd. The operating schedule called for two 11-hour shifts daily—working 7 days a week. The amount of material handled per month averaged 21,647 cu. yd.

Flexibility and ease of handling are features of this design. The No. 700 machine is capable of

Lorain 60 at plant of Florala Lime Products Company

full-circle rotation, the entire unit swinging with the boom. This keeps the operator in full view of his work at all times and assures equally efficient digging in any position. The caterpillar treads permit rapid movement over boggy, soft ground, giving the machine a virtually unrestricted field of action under most conditions.

The 7½ by 10½-in. Atlas diesel engine used with the P & H dragline is reported to have met all requirements. It has consistently delivered sufficient power for the handling of capacity loads and the fuel consumption averages approximately 20 gal. per shift.

Among the advances of the Marion Steam Shovel Company for 1928, as outlined on page 137, December 19, 1928, PIT AND QUARRY is one making for fuel economy. It is the development of two diesel-powered shovels—one of 2-cu. yd. capacity and one of 1¼-cu. yd. capacity. They are diesel-powered but electric-driven and claimed to mark another milestone in the progress of the excavating equipment toward the internal combustion engine electric shovel. The 2-cu. yd. diesel-electric is in the line of succession to the Type 37. This line is the Type 480 group—steamers, electric with Ward-Leonard control and diesel-electrics.

The engine used in the 2-cu. yd. unit is a Winton 6-cylinder, 4-cycle, airless injection engine, developing 150 hp. at 750 r.p.m. It has a 7-bearing, 4½-in. diameter crankshaft and is direct-connected to a 50-kw. (continuous) drooping voltage generator which supplies current to the 3 mill type, roller bearing, fan-ventilated mica-insulated d.c. motors.

The diesel used in the 1¼-cu. yd. unit is a Buda M.A.N. 4-cylinder, 4-cycle, airless injection engine developing 92 hp. at 1,000 r.p.m. It has a 5-bearing crankshaft and is direct-connected to a 25-kw. drooping voltage generator. The motors are mill type and of the same construction as those of the 2-cu. yd. unit.

The Ohio Power Shovel Company, Lima, Ohio, has placed on the market a new diesel shovel, dragline, crane and drag shovel. It is equipped with a Buda M. A. N. 4-cylinder solid injection, 6-in. bore by 8-in. stroke engine delivering 92-hp. at 850 r.p.m. Many new and profit-making features are included.

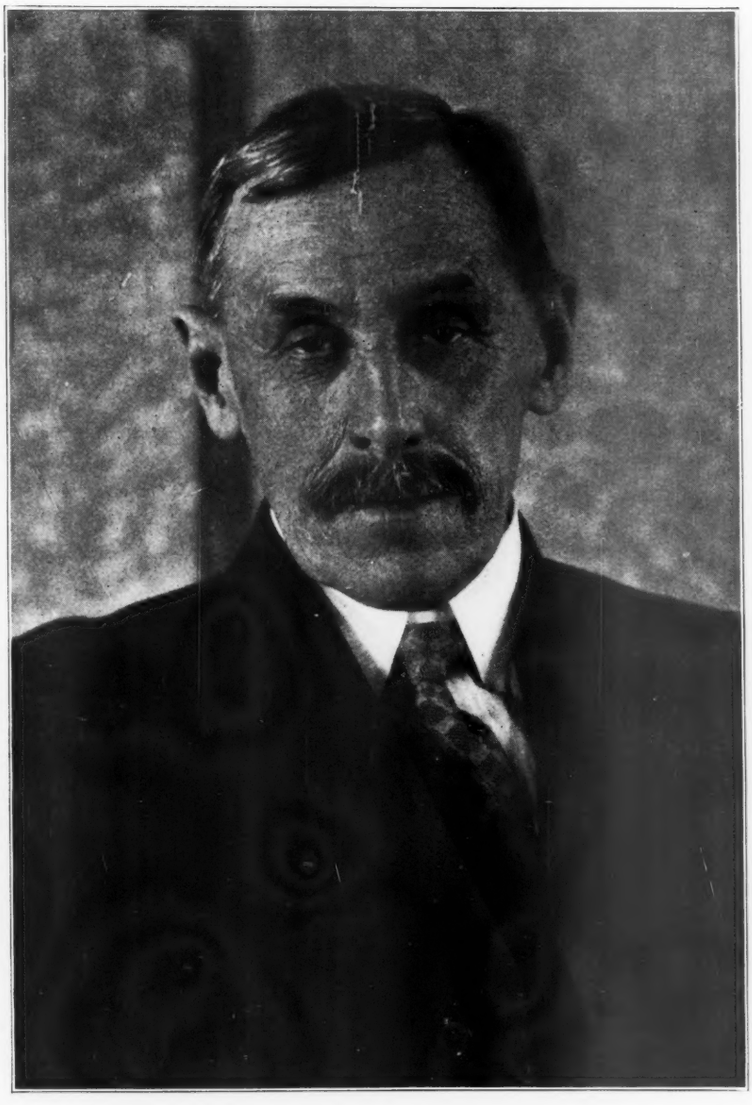
All Lima "101" diesel shovels, draglines, cranes and drag shovels are equipped with roller bearings—a Timken at every vital bearing point, independent differential crowd which responds instantly to the slightest motion of the crowding lever, a single line hoist with a pull of 30,000 pounds at a hoist speed of 100 feet in one minute, all main machinery bearings only 24 inches from the floor, giving a low center of gravity essential for heavy duty digging, and all main shafts on which are mounted sliding members are splined for accuracy in fit and elimination of vibration due to wear and backlash. It has a 73-in. roller path. Ninety-nine per cent of all the castings are specially heat-treated alloy steel. It has an outside type clutch and the brake bands are 5¼ in. wide and all are interchangeable. All shafts are oversize and of chrome nickel steel, ground to size. The pressed steel heavy-duty boom eliminates 50 per cent of the bolts and rivets required in ordinary types. The dipper handle is of pressed steel construction. Only three levers are needed to control all motions, just as with steam.

(To be continued in an early issue)

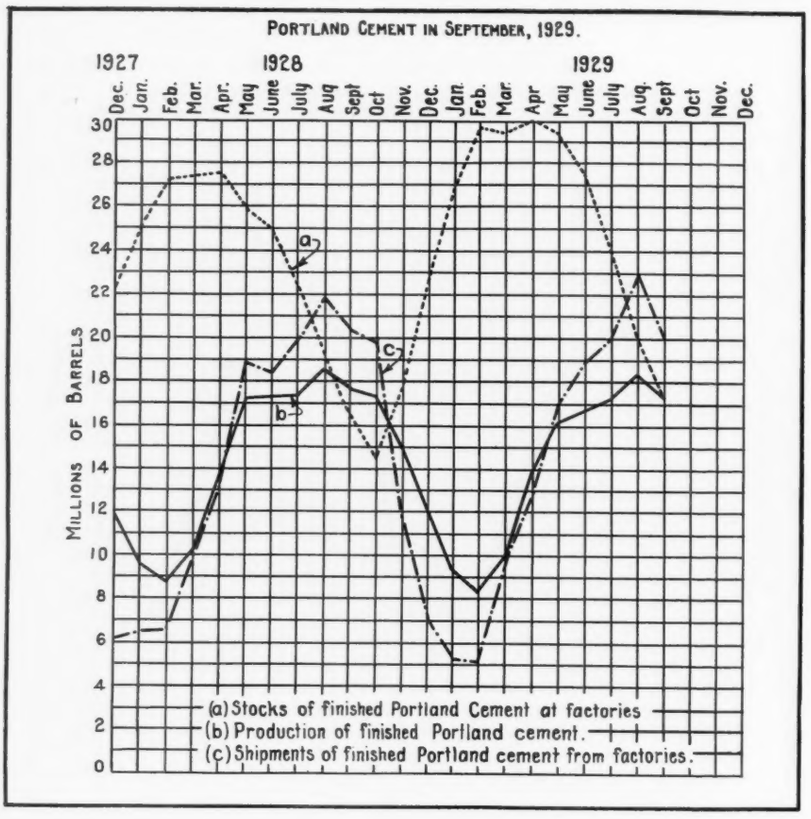
Lima "101" diesel-driven machine

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.



R. E. Haire
President and general manager
Canada Gypsum and Alabastine, Limited
Paris, Ontario


PORTLAND CEMENT IN SEPTEMBER, 1929.
1927
1928
1929
Dec. Jan. Feb. Mar. Apr. May June July Aug. Sept Oct Nov. Dec. Jan. Feb. Mar. Apr May June July Aug. Sept Oct Nov. Dec.
MILLIONS OF BARRELS
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
a
b
c
(a) Stocks of finished Portland Cement at factories
(b) Production of finished Portland cement.
(c) Shipments of finished Portland cement from factories.

Relation of Production to Capacity

	September 1928	September 1929	August 1929	July 1929	June 1929
	Per cent	Per cent	Per cent	Per cent	Per cent
The month	91.7	81.8	86.1	80.4	80.9
The 12 months ended	73.7	67.5	68.2	68.9	69.0

Production, shipments, and stocks of finished Portland cement, by districts, in September, 1928 and 1929, and stocks in August, 1929. (In thousands of barrels)

District	September Production 1928	September Production 1929	September Shipments 1928	September Shipments 1929	Stocks at end of month 1928	Stocks at end of month 1929	Stocks at end of August 1929a
Eastern Pa., N. J. and Md.	3,610	3,600	4,141	3,925	4.987	4,452	4,777
New York and Maine	1,205	1,241	1,355	1,434	1,273	1,274	1,467
Ohio, Western Pa., and W. Va.	2,276	1,919	2,559	2,386	2,159	2,685	3,152
Michigan	1,573	1,519	1,991	1,800	879	957	1,238
Wis., Ill., Ind., and Ky.	2,411	2,182	3,085	2,759	1,283	1,740	2,318
Va., Tenn., Ala., Ca., Fla., and La.	1,433	1,298	1,475	1,311	1,634	1,610	1,623
Eastern Mo., Ia., Minn., and S. Dak.	1,735	1,670	2,236	2,325	1,572	1,426	2,081
W. Mo., Neb., Kans., Okla., and Ark. b	1,201	1,422	1,270	1,542	1,164	805	926
Texas	544	707	520	680	281	493	466
Colo., Mont., Utah, Wyo.b, and Idahob.	321	314	316	358	387	475	518
California	1,124	967	1,102	1,023	768	941	997
Oreg. & Wash.	451	384	410	407	412	471	493
	17,884	17,223	20,460	19,950	16,799	17,329	20,056

Production, shipments, and stocks of finished Portland cement, by months, in 1928 and 1929. (In thousands of barrels)

Month	Production 1928	Production 1929	Shipments 1928	Shipments 1929	Stocks at end of month 1928	Stocks at end of month 1929
January	9,768	9,881	6,541	5,707	25,116	26,797
February	8,797	8,522	6,563	5,448	27,349	29,870
March	10,223	9,969	10,135	10,113	27,445	29,724
April	13,468	13,750	13,307	13,325	27,627	30,151
May	17,308	16,151	18,986	16,706	25,984	29,624
June	17,497	16,803	18,421	18,949	25,029	27,457
July	17,474	17,281	19,901	20,295	22,580	24,525
August	18,759	18,585	21,970	23,052	19,374	20,056
September	17,884	17,223	20,460	19,950	16,799	17,329
October	17,533	.....	19,836	.....	14,579	.....
November	15,068	.....	11,951	.....	17,769	.....
December	12,189	.....	7,384	.....	22,650	.....
	175,968	.....	175,455	.....	.....	.....

Cement Statistics for September, 1929

The portland cement industry in September, 1929, produced 17,223,000 barrels, shipped 19,950,000 barrels from the mills, and had in stock at the end of the month 17,329,000 barrels, according to the United States Bureau of Mines, Department of Commerce. The production of portland cement in September, 1929, showed a decrease of 3.7 per cent and shipments a decrease of 2.5 per cent, as compared with September, 1928. Portland cement stocks at the mills were 3.2 per cent higher than a year ago. The total production for the nine months ending September 30, 1929, amounts to 128,165,000 barrels, compared with 131,178,000 barrels in the same period of 1928, and the total shipments for the nine months ending September 30, 1929, amount to 123,545,000 barrels, compared with 136,284,000 barrels in the same period of 1928.

The output of two more new plants, located respectively in Arkansas and western Pennsylvania, is included in the statistics here presented which are compiled from reports for September, from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 166 plants at the close of September, 1929, and of 159 plants at the close of September, 1928. In addition to the capacity of the new plants which began operating during the twelve months ended September 30, 1929, the estimates include increased capacity due to extensions and improvements at old plants during the period.

Production of Stone in 1928

Production of stone in the United States in 1928, exclusive of stone manufactured into lime, cement, and abrasive materials, or crushed into sand, amounted to 133,869,519 short tons, valued at $196,820,697, according to a compilation of reports from producers made by the United States Bureau of Mines, Department of Commerce. The figures show a decrease of 2 per cent from the 1927 production figure of 136,345,130 short tons.

Stone sold for flagging, rubble, furnace flux, manufacturing industries, and miscellaneous uses increased in quantity and stone sold for construction, monumental stone, paving blocks, curbing, crushed stone, riprap, agri-

cultural limestone, and refractory decreased.

Building Stone

The building stone sold amounted to 30,795,530 cubic feet—4 per cent less than in 1927. This includes stone for architectural work and relatively low-priced stone for rough construction, such as foundation, bridges, and unshaped face stone for buildings and retaining walls.

More than one-half of the building stone sold was limestone—17,641,370 cubic feet, valued at $20,193,963, this quantity being 2 per cent more than in 1927. The largest quarry center for building limestone, the Bedford-Bloomington district in Indiana, reported total sales from the quarries of 14,520,260 cubic feet in 1928, valued at $17,760,622, an increase of 7 per cent in quantity over 1927. Of this total, 4,520,320 cubic feet, valued at $2,696,376 was sold as rough stone; 5,925,070 cubic feet, $4,482,021, sawed stone and semi-finished stone; and 4,074,870 cubic feet, $10,582,225 cut stone. The mills of this district not operated in connection with the quarries reported sales of 322,645 cubic feet of sawed stone, valued at $284,034; 31,750 cubic feet of semi-finished stone, valued at $50,526; and 822,925 cubic feet of cut stone, valued at $2,259,664. High grade building limestone quarried at Carthage, Mo., amounted to 450,670 cubic feet; at Bowling Green, Ky., to 116,180 cubic feet; at Mankato and Kasota, Minn., to 184,610 cubic feet.

Total sales of granite for building stone (6,704,430 cubic feet, valued at $7,671,013), represented nearly one-fifth of the building stone produced in 1928, and increased 5 per cent in quantity from 1927. The granite sold for architectural work, including rough and dressed stone, was 2,417,870 cubic feet, valued at $6,956,689. The principal states producing granite for architectural building stone were Massachusetts (802,490 cubic feet); Maine (450,360 cubic feet); Minnesota (297,390 cubic feet); New Hampshire (138,550 cubic feet); and Georgia (119,590 cubic feet). Pennsylvania, Massachusetts, and Maryland produced a considerable quantity of granite for rough construction work.

Total sales of sandstone for building (2,622,690 cubic feet, valued at $2,643,277), a decrease in quantity of 34 per cent from 1927. Sandstone for architectural work, including rough, sawed, and finished stone, amounted to 1,940,740 cubic feet, valued at $2,493,967. Ohio produced 1,390,630 cubic feet. Kentucky, New

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the States to which cement was shipped during July and August, 1918 and 1929.

Portland cement shipped from mills into States in July and August, 1928 and 1929, in barrels*

Shipped to—	July		August	
	1928	1929	1928	1929
Alabama	267,843	227,381	315,341	271,466
Alaska	1,496	2,307	382	2,105
Arizona	42,336	46,241	57,033	57,184
Arkansas	123,490	181,615	150,173	187,688
California	1,081,470	905,437	1,166,958	1,007,181
Colorado	113,414	107,528	147,267	105,397
Connecticut	266,888	213,551	279,631	241,126
Delaware	35,077	43,016	29,447	56,135
District of Columbia	87,606	118,426	83,553	125,732
Florida	97,376	99,338	105,108	100,975
Georgia	135,770	157,113	181,254	160,279
Hawaii	21,832	21,348	25,413	26,037
Idaho	40,823	33,383	45,284	26,051
Illinois	2,321,485	1,835,790	2,581,921	1,969,576
Indiana	712,107	745,533	804,868	990,059
Iowa	873,528	809,784	813,328	1,108,711
Kansas	215,125	225,611	233,127	338,052
Kentucky	192,746	187,060	216,674	205,597
Louisiana	113,049	117,311	125,319	172,697
Maine	63,915	73,594	71,721	79,258
Maryland	246,605	305,219	260,189	323,021
Massachusetts	334,822	335,635	308,837	365,297
Michigan	1,540,219	1,677,282	1,707,324	1,891,753
Minnesota	435,564	478,941	401,260	533,434
Mississippi	90,937	109,161	122,486	131,963
Missouri	484,207	725,967	541,927	896,327
Montana	58,225	67,366	66,954	89,417
Nebraska	110,938	150,214	127,833	270,919
Nevada	10,535	10,841	14,101	12,186
New Hampshire	46,025	98,708	69,903	116,275
New Jersey	861,340	877,662	878,977	958,357
New Mexico	36,795	25,281	43,079	29,932
New York	2,480,799	b2,596,425	2,774,981	2,768,232
North Carolina	221,912	171,148	218,950	149,085
North Dakota	72,490	69,425	61,931	47,870
Ohio	1,313,568	b1,236,231	1,549,784	1,364,665
Oklahoma	285,643	323,528	286,023	371,205
Oregon	140,619	101,161	175,733	124,852
Pennsylvania	1,437,571	b1,565,726	1,699,137	1,710,648
Porto Rico	.....	7,702	.....	6,995
Rhode Island	68,980	73,134	71,291	101,278
South Carolina	149,917	140,609	152,387	89,733
South Dakota	61,429	61,786	62,440	55,114
Tennessee	288,860	452,694	323,794	481,869
Texas	601,154	741,455	690,901	877,463
Utah	58,462	43,737	65,376	57,547
Vermont	64,211	145,097	103,293	181,612
Virginia	183,762	194,236	214,602	205,771
Washington	361,159	263,893	408,566	310,711
West Virginia	151,406	b194,649	166,289	209,590
Wisconsin	812,237	823,678	809,545	952,914
Wyoming	21,154	21,230	30,976	26,480
Unspecified	2,209	.....	30,779	49,633
	19,841,130	b20,241,188	21,873,450	22,993,454
Foreign Countries	59,870	53,812	96,550	58,546
Total shipped from cement plants	19,901,000	20,295,000	21,970,000	b23,052,00

*Includes estimated distribution of shipments from three plants in July and August, 1928, and in July, 1929; from four plants in August, 1929.
bRevised.

Production and stocks of clinker (unground cement), by districts, in September, 1928 and 1929. (In thousands of barrels)

District	Production		Stocks at end of month	
	1928	1929	1928	1929
Eastern Pa., N. J., and Md.	3,280	3,250	1,296	1,327
New York and Maine	1,101	1,023	706	507
Ohio, Western Pa., and W. Va.	1,748	1,624	781	607
Michigan	1,260	1,239	758	538
Wis., Ill., Ind., and Ky.	2,073	1,731	320	512
Va., Tenn., Ala., Ga., Fla., and La.	1,401	1,150	827	680
Eastern Mo., Ia., Minn., and S. Dak.	1,519	1,551	430	562
W. Mo., Neb., Kans., Okla., and Ark.b.	1,095	1,259	398	252
Texas	557	712	149	272
Colo. Mont. Utah, Wyo., and Idaho	309	263	292	314
California	1,201	1,020	1,273	1,060
Oreg. & Wash.	365	319	336	408
	15,909	15,141	7,566	7,039

Production and stocks of clinker, by months, in 1928 and 1929. (In thousands of barrels)

Month	Production		Stock end of month		Month	Production		Stock end of month	
	1928	1929	1928	1929		1928	1929	1928	1929
January	11,839	12,041	9,672	9,642	July	15,981	15,180	11,707	11,619
February	11,363	11,255	12,237	12,436	August	16,202	a15,822	9,357	a8,993
March	12,501	12,450	14,463	14,948	September	15,909	15,141	7,566	7,039
April	13,844	14,166	15,002	15,472	October	15,782	.....	5,944	....
May	16,025	15,445	14,329	14,911	November	14,930	.....	5,953	.....
June	15,940	15,312	12,944	13,586	December	13,426	.....	7,422	.....

aRevised.
bThe inclusion of Wyoming begins with April, 1929; of Idaho with June 1929; of Arkansas with September, 1929.

Exports and Imports

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

Exports of hydraulic cement by countries in August, 1929

Exported to—	Barrels	Value
Canada	7,874	$34,009
Central America	2,442	6,595
Cuba	3,991	10,832
Other West Indies and Bermuda	4,659	9,991
Mexico	20,075	61,786
South America	15,201	69,128
Other countries	5,771	33,421
	60,013	225,762

Imports of hydraulic cement by countries and by districts, in August, 1929

Imported from—	District into which imported	Barrels	Value[e]
Belgium	Florida	500	$765
	Los Angeles	47,509	26,581
	Massachusetts	15,445	18,267
	New Orleans	13,073	16,182
	New York	15,050	17,179
	Oregon	10,427	13,195
	Porto Rico	3,516	8,329
	South Carolina	19,080	24,257
	Washington	250	313
	Total	124,850	125,068
Canada	Maine and New Hampshire	750	1,698
Denmark	Massachusetts	6,000	6,300
	New York	18,094	18,994
	Porto Rico	11,500	15,267
	Total	35,594	40,561
France	Massachusetts	739	1,523
Germany	Los Angeles	2,000	3,696
United Kingdom	New York	16,235	21,856
	Philadelphia	3,770	5,001
	Total	20,005	26,857
	Grand Total	183,938	199,403

Exports and imports of hydraulic cement, by months, in 1928 and 1929

Month	Exports 1928 Barrels	Exports 1928 Value	Exports 1929 Barrels	Exports 1929 Value	Imports 1928 Barrels	Imports 1928 Value	Imports 1929 Barrels	Imports 1929 Value
January	56,400	$204,875	78,639	$283,002	236,771	$315,797	151,302	$177,976
February	62,828	221,620	58,886	225,590	164,408	217,525	118,930	123,123
March	74,983	265,719	69,079	235,164	235,930	330,074	131,909	112,788
April	61,676	205,882	64,145	218,316	249,458	324,371	89,668	114,281
May	70,173	236,005	57,955	219,366	190,509	256,872	200,646	267,854
June	59,536	201,313	96,055	287,612	266,537	359,637	203,545	228,170
July	83,759	291,055	71,992	247,177	112,887	151,877	182,098	199,960
August	88,736	302,866	60,013	225,762	259,975	358,471	183,938	199,403
September	71,995	252,843	.....	.....	173,439	226,295	.....	.....
October	62,137	246,010	.....	.....	152,210	226,099	.....	.....
November	69,313	260,310	.....	.....	65,969	89,732	.....	.....
December	63,120	250,204	.....	.....	175,992	233,300	.....	.....
	824,656	2,938,702	.....	.....	2,284,085	3,090,860	.....	.....

Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, in August, 1929

	Barrels	Value
Alaska	2,151	$6,479
Hawaii	22,589	54,848
Porto Rico	10,412	23,628
	35,152	84,955

York, Pennsylvania, Wisconsin, and other states also reported considerable amounts.

Marble sold for building stone in 1928 amounted to 3,024,640 cubic feet, valued at $12,109,327, 7 per cent more in quantity than in 1927. The principal states producing building marble are Tennessee (1,190,760 cubic feet); Missouri (606,280 cubic feet); Vermont (655,180 cubic feet); and Georgia (210,860 cubic feet). Alabama, Alaska, Arkansas, California, Colorado, Maryland, Massachusetts, New Jersey, New York, Pennsylvania, and Utah also furnish marble for building purposes. The product from Georgia and Missouri is chiefly for exterior building and that from Tennessee and Vermont for interior work. Serpentine (109,590 cubic feet, valued at $854,707) quarried in Georgia, Maryland, Massachusetts, New Jersey, Pennsylvania, and Vermont, is included in the marble figures. There was also sold 53,840 short tons of serpentine, valued at $104,764. The total sales of marble reported from Carthage, Mo., for 1928, were 465,390 cubic feet, valued at $1,033,158, an increase in quantity of 33 per cent over 1927. This includes a small quantity of monumental stone.

Basalt showed a small increase in quantity over 1927, and various miscellaneous varieties of stone used chiefly for rough construction showed a large decrease.

Monumental and Memorial Stone

Stone sold for monumental and memorial work in 1928 amounted to 4,203,780 cubic feet, valued at $14,966,498, a decrease of 3 per cent in quantity.

Granite (including rough and dressed stone) reported as sold for this purpose in 1928 was 3,172,730 cubic feet, valued at $11,217,229, a decrease of less than 1 per cent in quantity. The principal states producing granite for monumental work in 1928 were Vermont (1,394,560 cubic feet, of which the Barre district produced 1,225,800 cubic feet); Massachusetts (243,820 cubic feet, of which the Quincy district produced 154,060 cubic feet); Georgia (186,380 cubic feet); Minnesota (279,780 cubic feet); Wisconsin (126,800 cubic feet); Maine (123,660 cubic feet); and New Hampshire (98,870 cubic feet).

Sales of marble for monumental work (including rough and finished stone) in 1928 were reported as 1,031,050 cubic feet, valued at $3,749,269, a decrease of 8.5 per cent in quantity. Vermont produced 587,120 cubic feet, Georgia 331,340 cubic feet, and Alabama, Arkansas, Colorado, Massachusetts, Missouri, New York, and Tennessee much smaller amounts.

Street and Road Work and Concrete

Street and road metal in general showed decreased sales in 1928. Paving blocks (35,426,860 blocks, valued at $3,113,526) decreased 8 per cent in quantity. Stone sold for flagstones (932,900 cubic feet, valued at $717,049) increased 26 per cent. Stone sold for curbing (4,832,160 cubic feet, valued at $4,698,313) decreased slightly. Total crushed stone amounted to 91,265,360 short tons, valued at $94,186,259 in 1928, a decrease of 4 per cent in quantity. Crushed stone for concrete and road work (74,384,490 tons, valued at $81,041,349) decreased 5 per cent in quantity, and crushed stone reported as used for railroad ballast (16,880,870 tons, valued at $13,144,910) increased 3 per cent.

Fluxing Stone

Stone sold for fluxing to blast furnaces, open hearth steel works, smelters, and other metallurgical plants, amounted to 23,123,870 short tons, valued at $16,957,264, an increase of 7 per cent in quantity.

Refractory Stone

Stone reported for refractory use, which includes dolomite, quartzite, and mica schist, amounted to 1,348,160 short tons, valued at $1,745,066, in 1928, a decrease in quantity of 1 per cent. Raw dolomite reported as sold for the manufacture of refractories in 1928 amounted to 522,850 short tons, valued at $509,502. Besides this quantity, operators who both quarry and dead-burn or sinter dolomite reported 448,761 tons of sintered material, valued at $4,283,036. The quantity of raw dolomite reported was 20 per cent more than in 1927, and the sintered material also increased 20 per cent. Quartzite (ganister) used in the manufacture of refractory brick, for furnace lining, and for the manufacture of ferrosilicon, amounted to 790,630 short tons, valued at $1,098,945. This was a decrease of 12 per cent in quantity. Sales of mica schist for furnace and kiln lining, which is quarried in Montgomery County, Pa., near Edge Hill, amounted to 34,680 tons, valued at $136,619, an increase in quantity of 24 per cent.

Shipments of Hydrated Lime from Plants in the United States and in Ohio, 1927-28, by Destinations

Destination	From all plants: Short tons	From all plants: Distribution (per cent)	From Ohio plants: Short tons	From Ohio plants: Distribution (per cent)	From Ohio plants: Group total (per cent)
1927					
Ill., Ind., Mich., Ohio	443,670	27.8	338,469	48.2	76.3
Del., D. C., Md., N. J., N. Y., Pa., W. Va.	649,564	40.7	252,455	35.9	38.9
Conn., Me., Mass., N. H., R. I., Vt.	73,046	4.6	22,046	3.1	30.2
Fla., Ga., N. C., S. C., Va	140,001	8.8	35,642	5.1	25.5
Ala., Ky., La., Miss., Tenn	75,911	4.7	20,244	2.9	26.7
Ark., Iowa, Kans., Minn., Mo., Nebr., Okla., Tex., Wis.	157,794	9.9	28,016	4.0	17.8
Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., N. Dak., Ore., S. Dak., Utah, Wash., Wyo.	46,837	2.9	2,031	.3	4.3
Undistributed and exports	10,083	.6	3,343	.5	33.2
	1,596,906	100.0	702,246	100.0	44.0
1928					
Ill., Ind., Mich., Ohio	417,086	25.9	306,733	45.5	73.5
Del., D. C., Md., N. J., N. Y., Pa., W. Va.	647,443	40.1	249,683	37.0	38.6
Conn., Me., Mass., N. H., R. I., Vt.	77,749	4.8	25,582	3.8	32.9
Fla., Ga., N. C., S. C., Va	145,884	9.1	35,083	5.2	24.0
Ala., Ky., La., Miss., Tenn	92,607	5.7	19,983	3.0	21.6
Ark., Iowa, Kans., Minn., Mo., Nebr., Okla., Tex., Wis.	165,016	10.2	30,708	4.5	18.6
Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., N. Dak., Ore., S. Dak., Utah, Wash., Wyo	54,085	3.4	2,961	.4	5.5
Undistributed and exports	12,948	.8	3,911	.6	30.2
	1,612,818	100.0	674,644	100.0	41.8

Stone Sold or Used by Producers in the United States, 1927 and 1928, by Uses

USE	1927 Quantity	1927 Value	1928 Quantity	1928 Value
Building stone.....cubic feet	32,104,200	$ 40,595,127	30,795,530	$ 42,769,904
Short tons—approximate	2,485,120		2,453,330	
Monumental stone.....cubic feet	4,325,390	14,798,691	4,203,780	14,966,498
Short tons—approximate	358,000		347,760	
Paving blocks.....number	38,705,560	3,583,400	35,426,860	3,113,526
Short tons—approximate	366,740		349,290	
Curbing.....cubic feet	4,862,580	4,939,716	4,832,160	4,698,313
Short tons—approximate	378,230		383,070	
Flagging.....cubic feet	737,680	573,736	932,900	717,049
Short tons—approximate	55,160		74,900	
Rubble.....short tons	809,020	998,108	907,890	1,249,703
Riprap.....short tons	4,618,500	4,716,731	3,993,190	3,865,895
Crushed stone.....short tons	94,948,770	97,474,267	91,265,360	94,186,259
Furnace flux (limestone and marble).....short tons	21,666,070	15,985,525	23,123,870	16,957,264
Refractory stone (ganister, mica schist, and dolomite).....short tons	1,362,920	1,710,708	1,348,160	1,745,066
Agricultural limestone.....short tons	2,206,470	3,360,704	2,186,870	3,153,848
Manufacturing industries (limestone and marble).....short tons	5,352,130	4,735,114	5,639,750	4,723,810
Other uses.....short tons	1,738,000	4,995,395	1,796,070	4,673,562
Total (quantities approximate in short tons)	136,345,130	$198,647,222	133,869,510	$196,820,697

Sales and Distribution of Lime in 1928

The lime sold by producers in the United States in 1928 amounted to 4,458,412 short tons, valued at $36,449,635, according to figures obtained from a compilation of reports made by lime manufacturers to the United States Bureau of Mines, Department of Commerce, in cooperation with the Geological Surveys of Alabama, Florida, Georgia, Illinois, Iowa, Kansas, Maryland, Michigan, Missouri, New Jersey, New York, North Carolina, Oklahoma, Texas, Virginia, Washington, and Wisconsin. This represents an increase of about 1 per cent in quantity and a decrease of 6 per cent in value as compared with 1927. Sales of hydrated lime, which are included in these figures, amounted to 1,612,818 tons, valued at $13,540,215, an increase of 1 per cent in quantity and a decrease in value of 7 per cent. The average unit value of all lime showed a decrease from $8.75 a ton in 1927 to $8.18 in 1928, and that of hydrated lime a decrease from $9.13 a ton in 1927 to $8.40 a ton in 1928.

Sales of lime used in the manufacture of chemicals—2,138,037 tons, valued at $16,455,657—increased 10 per cent in quantity; lime sold for construction—1,986,465 tons, valued at $17,706,420—decreased 7.5 per cent in quantity; and that sold for agricultural purposes—333,910 tons, valued at $2,287,558—increased 3 per cent in quantity. The following table shows sales of lime by uses in 1927 and 1928.

Ohio, the largest producing State (1,013,676 tons, valued at $8,919,596 in 1928), showed an increase of 2.6 per cent in quantity reported, and Pennsylvania (834,050 tons, valued at $6,119,036 in 1928) increased 2.5 per cent in quantity over 1927. Total reporting was 411.

Lime Shipped in the United States, 1927-28, by Destinations, in Short Tons

Destination	1927 Hydrated lime	1927 Quicklime	1927 Total	1928 Hydrated lime	1928 Quicklime	1928 Total
Ill., Ind., Mich., Ohio	443,670	650,163	1,093,833	417,086	663,407	1,080,493
Del., D. C., Md., N. J., N. Y., Pa., W. Va.	649,564	1,036,069	1,685,633	647,443	1,051,076	1,698,519
Conn., Me., Mass., N. H., R. I., Vt.	73,046	219,818	292,864	77,749	202,890	280,639
Fla., Ga., N. C., S. C., Va.	140,001	125,452	265,453	145,884	124,178	270,062
Ala., Ky., La., Miss., Tenn.	75,911	264,208	340,119	92,607	264,494	357,101
Ark., Iowa, Kans., Minn., Mo., Nebr., Okla., Tex., Wis.	157,794	300,541	458,335	165,016	321,596	486,612
Ariz., Calif., Colo., Idaho, Mont., Nev., N. Mex., N. Dak., Ore., S. Dak., Utah, Wash., Wyo.	46,837	207,506	254,343	54,085	200,006	254,091
Undistributed and exports	10,083	14,269	24,352	12,948	17,947	30,895
	1,596,906	2,818,026	4,414,932	1,612,818	2,845,594	4,458,412

Lime Sold by Producers in the United States, 1927 and 1928, by Uses

USE	1927 Short tons	1927 Value	1928 Short tons	1928 Value
Agricultural	322,893	$ 2,237,871	333,910	$ 2,287,558
Building	2,148,840	20,962,759	1,986,465	17,706,420
Chemical:				
Glass works	78,994	$ 665,026	76,161	$ 588,305
Metallurgy	406,063	2,640,658	504,248	3,055,081
Paper mills	429,606	3,413,030	429,334	3,260,733
Refractory lime (dead-burned dolomite)	374,415	3,459,803	448,761	4,283,036
Sugar refineries	16,086	235,555	22,678	280,186
Tanneries	63,666	501,442	64,464	494,983
Other uses	574,369	4,522,269	592,391	4,493,333
Total chemical	1,943,199	$15,437,783	2,138,037	$16,455,657
	4,414,932	$38,638,413	4,458,412	$36,449,635
Hydrated lime (included in above totals)	1,596,906	14,581,695	1,612,818	13,540,215

International First-Aid and Mine-Rescue Meet Held at Kansas City, Mo., Is Pronounced Success

THE annual International First-Aid and Mine-Rescue Contest for 1929, held at Kansas City, Mo., September 12, 13 and 14, was one of the most successful meets of the kind yet held, says the United States Bureau of Mines, Department of Commerce, in reviewing the event. Forty first-aid teams representing 18 States and 9 mine rescue teams representing 6 States participated in the contest. Prominent mining men, officials of state mining departments from all parts of the country, and representatives from Mexico and Canada were present. Remarkable proficiency in the practice of first-aid and mine-rescue methods was demonstrated by all participating teams.

The highest honors of the contest were won by the combination first-aid and mine-rescue team of the Northwestern Improvement Company, Roslyn, Wash. The team of the Madison Coal Corporation, Mt. Olive, Ill., won second honors in this event, while that of the Buckeye Coal Company, Nemacolin, Pa., won third honors.

In the first-aid contest, first honors went to the team representing the Utah Copper Company of Bingham Canyon, Utah. Second honors in the first-aid contest were awarded the team of the Colorado Fuel and Iron Company, Pueblo, Colo., and third honors went to the team of Pickands-Mather and Company, Bessemer, Mich.

In the mine-rescue contest, first prize was awarded to the team of the Consolidation Coal Company, Frostburg, Md. In this contest the second prize was awarded to the team of the Northwestern Improvement Company, Roslyn, Wash., and third prize to that of the Madison Coal Company, Mt. Olive, Ill.

The official judges, including United States Bureau of Mines officials, State mine inspectors, and safety engineers from many prominent mining companies, were especially gratified at the high general averages of proficiency attained by the competing companies. In the first-aid contest, the five leading contestants attained averages in excess of 98 per cent, while the lowest average attained by any of the 40 contesting teams was 94.2 per cent. The participating teams represented metal-mining, coal-mining, metallurgical, sulphur-mining, petroleum-producing, fluorspar-mining and cement rock quarrying operations. The highest ranking team, that of the Northwestern Improvement Company, Roslyn, Wash., won similar honors last year. The team sent by the Utah Copper Company, Bingham Canyon, Utah, which won highest first-aid honors, is practically a new-comer in the field. The team of the Colorado Fuel and Iron Company, Pueblo, Colo., which won second prize in the first-aid contest, is the first team to be sent by the smelting department of this company to an international meet. The team representing Pickands-Mather and Company, Bessemer, Mich., which won third prize in the first-aid contest, is the first team to represent the great Lake Superior iron and copper mining industries at an international meet.

In addition to the nation-wide contests, separate state competitions were staged. State first-aid honors went to the following-named teams:

Phelps Dodge Corporation, Morenci, Arizona.
Colorado Fuel and Iron Company, Pueblo, Colorado.
Peabody Coal Company, Midland First Aid Ass'n, Kincaid, Ill.
Consolidated Ind. Coal Co., Mine No. 2, Melcher, Iowa.
Shell Petroleum Corporation, Arkansas City, Kansas.
Standard Oil Company, Baton Rouge, La.
Consolidation Coal Company, Inc., Frostburg, Md.
Pickards-Mather and Company, Ironwood, Mich.
Anaconda Copper Mining Company, Great Falls, Mont.
Commerce Mining and Royalty Co., Miami, Oklahoma.
Pittsburg Coal Co., Mansfield Mine, Pittsburgh, Pa.
Homestake Mining Company, Lead, South Dakota.
Freeport Sulphur Company, Freeport, Texas.
Utah Copper Company, Bingham Canyon, Utah.
Stonega Coke and Coal Company, Roda, Virginia.
Northwestern Improvement Company, Roslyn, Wash.
Fordson Coal Company, Twin Branch, West Virginia.
Northeast Coal Company, Paintsville, Kentucky.

The Congressional bronze medallions, awarded by act of Congress for permanent possession of the first-aid and mine-rescue teams winning first place in the International First-Aid Contest, were the banner prizes awarded. Numerous other prizes were presented by various mine operators associations, the National Safety Council, the American Red Cross, the United Mine Workers of America, the National Coal Association, and others.

The chief judges for the first-aid contests were J. V. Berry, Johnstown, Pa.; Dr. R. W. Holbrook, Kansas City, Mo.; and A. W. Cantwell, St. Louis, Mo. W. G. Duncan, State College, Pa., was the chief judge for the mine-rescue contests. The Chief Recorder was Dr. A. F. Knoefel of Terre Haute, Ind.

The International First-Aid and Mine-Rescue Contests are held each year under the auspices of the United States Bureau of Mines and are sponsored by various mining, industrial and civic organizations. Employees of coal and metal mines, quarries, and metallurgical plants, and workers in the oil and gas industries are eligible to participate in the contest, so that more than 2,000,000 workers, living in practically every State and territory, are interested. The teams competing in the international contests usually represent the winning teams from district and State contests held throughout the country.

Coming Events

Nov. 12-15, 1929. San Antonio, Tex. Annual meeting, American Association of State Highway Officials.

Nov. 13-15, 1929. Chicago. Annual convention, International Acetylene Association, at the Congress Hotel. A. Cressy Morrison, secretary, 30 E. 42nd St., New York, N. Y.

Nov. 20-23, 1929. Fort Worth, Tex. Annual convention, International City Managers' Association.

Dec. 2-7, 1929. New York, N. Y. National Exposition of Power and Mechanical Engineering at the Grand Central Palace. International Exposition Company, New York, N. Y. Mr. Roth, secretary.

Dec. 4-6, 1929. Chicago. Annual meeting, National Paving Brick Manufacturers' Association, at the Palmer House. W. C. Schlesinger, secretary, National Press Bldg., Washington, D. C.

Jan. 11-18, 1930. Atlantic City, N. J. Annual convention and show, American Road Builders' Association. E. A. Birchland, secretary, 37 W. 39th St., New York, N. Y.

Jan. 20-23, 1930. Cincinnati, O. Annual convention and Manufacturers' Division Exposition, National Crushed-Stone Association, at Hotel Gibson. J. R. Boyd, secretary, Merchandise Bldg., 14th and S Sts., N. W., Washington, D. C.

Jan. 28-30, 1930. Memphis, Tenn. Annual convention and Manufacturers' Division Exposition, National Sand & Gravel Association, at the Peabody Hotel. V. P. Ahearn, executive secretary, Munsey Bldg., Washington, D. C.

Feb. 11-13, 1930. New Orleans, La. Annual meeting, American Concrete Institute, at the Roosevelt Hotel.

Mar. 3-7, 1930. Chicago. National Industrial Exposition at the Stevens Hotel. George Pfisterer, secretary, 308 W. Randolph St., Chicago.

Your Mind and Health

By Dwight S. Anderson

ELBERT HUBBARD once attributed most of the ills of mankind to a mistaken effort to try to get more out of life than there is in it.

Certainly every living creature, including man, is endowed with an instinctive impulse to get all it can from its environment. By environment is meant everything not a part of the individual. This includes food, and with human beings also clothing, houses, automobiles, and—vitally important in this consideration—other individuals. Failure to efficiently adapt personality to environment means trouble, mental or physical.

Schopenhauer believed that happiness was not a positive thing; that it was the absence of pain, and that health was the absence of disease. What then is disease? There are those who think it is purely mental in its cause and that even the effects are mental; there are those on the other hand who think that consciousness does not exist, and that all the functions of living and thinking are purely physical. The truth seems to be that we cannot regard the mind and body as being separate entities, except for purely academic purposes. An individual is healthy when he responds as a whole efficiently to his environment. In psychology there is no need for taking up cudgels for one side or the other, just as it is unnecessary to deny the influence of environment on the race in order to support that of heredity.

The real test of sanity, according to George K. Pratt, M. C., assistant medical director of the National Committee for Mental Hygiene, is one's ability to get along in the community with the minimum of friction. Persons who are continuously in trouble with friends, associates and people with whom they come in contact, are mentally disordered, if not diseased.

Pressure of affairs especially in city life, often results in failure to adjust oneself to conflicting demands and this may mean ultimate breakdown. In such cases it is quite obvious that mental and emotional attitudes can affect the success or failure of the enterprises in which we are engaged. But does not the quality and direction of thinking also affect diseases which are not commonly associated with thinking, such as tuberculosis for example, known to be a germ-carried disorder? A moment's consideration will show the importance of mental attitudes in relation to tuberculosis.

As the death-rate from this disease among girls between 15 and 19 inclusive is nearly twice that of boys, we will select a high school girl as an example, for the consideration of mental attitude in connection with ill-health. By the time she is 15, she may have been infected with the germs of tuberculosis—probably 40 per cent of girls that age living in cities have been. Fortunately, this infection ordinarily creates a relative immunity, but this immunity is constantly subject to being broken down. In the cases where active disease results what seem to be pre-disposing circumstances? The girl is working hard at school, which consumes a great deal of her vitality; there should be no further great drains on it. Yet she cultivates the slender form by denying herself necessary nourishing food; she is popular in her social circle and attends late dances, going without sufficient sleep in order to meet the requirements of the classroom next day. Unable to do all this and still fight the tuberculosis germs, her organism does what she would not do—it eliminates something from the program, withdraws resistance, and lets the germs prosper.

This situation is typically a failure to adjust efficiently to the environment, and it is truly mental in the sense that prevention of tuberculosis in such a case requires a modification of the desires and ambitions of the individual. There must be a recognition of the power of environment; that energy is exhaustible and must be renewed by rest, fresh air and nourishing food; that youth is not omnipotent.

Such a case as this needs to be discovered in time if effective preventive work is to be done. Facilities exist in many communities for observation of high school students, boys as well as girls, and for finding those in danger of tuberculosis before the point of imperative and drastic action has been reached. Public health nurses, including school nurses, have been financed in many communities with money raised by Christmas seals. Work along the same line is being carried on by tuberculosis associations in the grade schools also, helping to inculcate health habits in the young which will form the right—by this is meant the effective—mental viewpoint; and drive home the fact that health depends on choosing courses of conduct compatible with effective functioning.

The Christmas seal sale itself is educational. Speakers who urge people to buy the seals also spread health information and knowledge. What the symptoms of tuberculosis are; that it is curable if taken in time; that periodic health examinations preserve health; that the tuberculin-test and X-ray are invaluable aids in the discovery of the disease in doubtful cases especially among the young—these facts are becoming known to everybody who buys or who sells the Christmas seals in every town, city, and hamlet in the country.

Nothing has been said here of the physical side of the fight against tuberculosis—a subject having a multitude of interesting phases. It is hoped in this brief article merely to point out the importance of the mind in connection with health, and to emphasize the saying of the Sage of East Aurora, that we cannot get more out of life than there is in it.

Government Statistics of Cement

American portland cement mills show a further decline in the ratio of operations to capacity for 12 months' period ending September 30. According to statistics released recently by the Bureau of Mines of the Department of Commerce, the ratio of operations to capacity for the last twelve months was 67.5 per cent. The ratio percentage has fallen steadily from a maximum of 71.1 per cent for twelve months ending April 30 to 67.5 per cent in September.

During the month 17,223,000 barrels were produced, 19,950,000 barrels were shipped, and stocks on hand at the end of the month were 17,329,000 barrels. Production for September, 1929 was 3.7 per cent less, and shipments 2.5 per cent less than September, 1928. Stocks at the mills were 3.2 per cent higher than a year ago.

RECENT PATENTS

PIT AND QUARRY will furnish, at its actual cost, a copy of any patent cited below. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.

American

Storing material. Clarence O. Brown, Marion, Ohio, assignor to Fairchild Engineering Co. No. 1,728,197.

Rotary hammer mill. Walter J. Clement, Utica, N. Y., assignor to Bossert Corporation, same place. No. 1,728,392.

Resurfacing-machine. Robert T. Gardner, Philadelphia, Pa., assignor to National Slate Machine Co. No. 1,728,487.

Cement-grinding mill. Povl T. Lindhard, N. Y., assignor to F. L. Smidth & Co., New York, N. Y. No. 1,728,495.

Manufacture of Portland cement. Povl T. Lindhard, Brooklyn, N. Y., assignor to F. L. Smidth & Co., New York, N. Y. No. 1,728,496.

Material-control mechanism for concrete-mixers. James E. Bushnell, North Plainfield, N. J., assignor to Ransome Concrete Machinery Co., Plainfield, N. J. No. 1,728,527.

Apparatus for the manufacture of cement by fusion. George Dumas, Viviers, France. No. 1,728,597.

Screening plant for coke and similar materials. Hans Binte, Berlin-Spandau, Germany. No. 1,728,657.

Process for the industrial manufacture of artificial Portland cement. Jean J. Hendrickx, Paris, France. No. 1,728,828.

Coal or rock cutting machine. Francois J. B. Berry, Lille, France. No. 1,728,914.

Concrete construction. Nathan C. Johnson, Englewood, N. J. No. 1,728,936.

Process and apparatus for unloading granular materials. Lionel C. Hill, Montreal, P. Q. No. 1,728,968.

Apparatus for pulverizing coal. Harry M. Nobis, East Cleveland, Ohio. No. 1,728,976.

Process and apparatus for dredging stone and gravel. Harvey L. Shotwell, Buffalo, N. Y. No. 1,729,054.

Apparatus for washing, separating, and grading materials. Howard S. Gerken, Buffalo, N. Y., assignor to Gravel Products Corporation, same place. No. 1,729,070.

Mine-car. John H. Linhardt, St. Francois, Mo., assignor to National Lead Co. No. 1,729,113.

Method of clearing and filling tubular piles for foundations. William J. Gleasner, Buffalo, N. Y. No. 1,729,422.

Pulverizer. Grover E. Bear, Allentown, Pa. No. 1,729,471.

Grinding-mill. Alfred E. G. MacCallum, Wandsworth, England. No. 1,729,515.

Bucket and boom conveying and distributing mechanism. Samuel Shafer, jr., Milwaukee, Wis., assignor to Chain Belt Co., same place. No. 1,729,553.

Charging device for concrete-mixers. George T. Allen, New York, N. Y., assignor to Ransome Concrete Machinery Co. No. 1,729,602.

Coal-pulverizing machine. Ralph Jackson, Coventry, England, assignor to Alfred Herbert Limited, same place. No. 1,729,672.

Trenching-machine. Carroll H. Knauer, Muskegon, Mich., assignor to Austin Machinery Corporation, same place. No. 1,729,744.

Mining apparatus. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery Co., same place. No. 1,729,779.

Mining apparatus. Morris P. Holmes, Claremont, N. H., assignor to Sullivan Machinery, same place. No. 1,729,781.

Lining apparatus. Charles F. Osgood, Claremont, N. H., assignor to Sullivan Machinery Co., same place. No. 1,729,798.

Wedge-fit tooth-point (excavator-tooth). William T. McNinch, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill. No. 1,729,889.

Screening apparatus. Morley P. Reynolds, Cleveland Heights, Ohio, assignor to W. S. Tyler Co., Cleveland, Ohio. No. 1,729,965.

Grinding-mill. William A. Seymour, Leavenworth, Kans., assignor to Hesse Mfg. Co., same place. No. 1,730,300.

Vibratory screen. Alexander L. Munro, Milwaukee, Wis., assignor to Smith Engineering Works, same place. No. 1,730,435.

Plaster and mortar mixer. John Alexander, Milwaukee, Wis. No. 1,730,713.

Method of and apparatus for determining the consistency of concrete. Erich H. Lichtenberg, Milwaukee, Wis., assignor to Koehring Co., same place. No. 1,730,893.

Apparatus for handling concrete materials. Julien A. Bried, Oakland, Cal., assignor to Barrymore Concrete Mixer Corporation, San Francisco, Cal. No. 1,730,912.

Process for the improvement of the manufacture of cement from slag. John G. Bergquist, New York, N. Y. No. 1,731,189.

Single-zone pulverizing apparatus. David K. Beach, Worcester, Mass., assignor to Riley Stoker Co., same place. No. 1,724,895.

Concrete-transporting apparatus. Henry W. St. John, Bridgewaters, N. Y. No. 1,725,682.

Machine for conditioning gravel. Howard Kenyon, Houston, Tex. No. 1,725,868.

Excavating and loading machine. Robert P. Greenleaf, Shaker Heights, Ohio. No. 1,726,065.

Method and means for forming concrete pavements, etc. Robert D. Gregg, Kankakee, Ill. No. 1,726,222.

Sand-treating machine. Elmer A. Rich, Jr., Chicago, Ill., and Hutton H. Haley, Detroit, Mich., assignors to American Foundry Machine Co., New York, N. Y. No. 1,726,504.

Operating mechanism for ditching-machines and their carrier-cars. George T. Ronk, assignor to Speeder Machinery Corporation. No. 1,726,771.

Foreign

Skips with aerial ropeways. British Ropeway Engineering Co., Ltd., and H. F. H. Shields. British 314,580.

Forging rock drills. Ingersoll-Rand Co. British 314,044.

Aluminum oxide. Vereinigte Aluminum-Werke Akt.-Ges. British 313,409.

Grinding and crushing mills. Erie City Iron Works & Wohlenberg. British 313,582.

Grinding, crushing. Macao-Walzenmuhlen Ges. British 313,611.

Drilling rock. Minimax Akt. Ges. British 313,621.

Grinding, crushing. W. A. Cloud. British 313,656.

Mortar. Societe la Saponite. French 667,733.

Acid-proof cement. Societe la Saponite. French 667,734.

Porous concrete. I. G. Farbenindustrie A. G. French 667,821.

New cement and its preparation. Societe pour l'Exploitation des procedes Petrus. French 667,880.

Alumina. Jean C. Seailles. French 34,239.

Alumina. Jean C. Seailles. French 34,231.

Alumina. Jean C. Seailles. French 34,230.

Kiln for the treatment of lime, dolomite, natural cement, etc. I. Hubeaux, Belgian. 356,177.

Apparatus for drying clay, sand, chalk, etc. Robert de Reytere. French 656,913.

Artificial stone. K. Waldert. German 476,439.

Producing colored portland cements. Muhlenbau und Industrie A. G. German 476,849.

Discharge head for rotary kilns. Klockner-Werke A. G. German 481,012.

Smoke device for annular kilns. August Hunecke. German 481,057.

Duscgarge apparatus for shaft kilns, coolers, etc. Arno Andreas. German 481,058.

Apparatus for regulating combustion in firing. Dynamit A. G. German 478,022.

Compressed air centrifugal for concrete, mortars, sand and similar products. Svend Dyhr. German 479,894.

Process for production of concrete conduits, pressed tubes, vessels, etc. Gerhard Inhulsen. German 480,740.

Delivery device for materials. Fried Krupp Gruseruverk A. G. German 475,645.

Process for the production of acid-proof and fire-proof cement. Alfred Lehmann. German 483,110.

German Applications in File

Rotary kiln for the production of fused aluminous cement. Arno Andreas. German 56,798.

Charging device for shaft and rotary kilns for the burning of cement, lime, etc. E. Schwenk Co. German 88,649.

Lime or cement mortar. Alfred Genairon. German 72,502.

Process for the burning of cement, lime, gypsum and similar materials. G. Polysius Eisengiesserei, etc. German 72,069.

Process and apparatus for the production of fused cement. Fritz Conradi. German 40,983.

Process for the production of cement and lime in shaft kilns by blowing the slip into the upper part of the shaft and blowing the fuel and air through opening in the lower part. August Bues. German 137,051.

MANUFACTURERS' PUBLICATIONS

Each publication listed below contains information of interest to non-metallic mineral producers. Readers may obtain, without charge—except where a price may be stated—and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when making such requests.*

Air Compressors

"Air-Compressor Lubrication." 3 p., 1 ill. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Discusses the lubrication problems encountered in air-compressor operation.

Bearings, Anti-Friction

"Causes and Prevention of Anti-Friction Bearing Failures." 6 p., 4 ill. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Discusses the effects of improper installation, insufficient or improper lubrication, and the presence of dirt or foreign matter on bearing life.

Belts

"'Getting Even' with Belts." 5 p., 5 ill. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Discusses the importance of guarding belts and the various methods in use.

"Significance of Slack Belts." 5 p., 3 ill. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Discusses the advantages of slackness in belt operation.

Boilers

"Aspects of Boiler Efficiency." 5 p., 4 charts. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Discusses the overall gross efficiency of steam-generating plants.

Cement, Refractory

Strong Joints and Longer Life Brick. 12 p., 21 ill. (Harbison-Walker Refractories Co., Pittsburgh, Pa.) Describes and illustrates the use of Firebond, a refractory cement.

Concrete Mixers

Ransome 56 and 84-S Mixers. 8 p., 7 ill. (Bulletin No. 122, Ransome Concrete Machinery Co., Dunellen, N. J.) Describes details of the parts of two types of concrete mixers fitted with spiral cut-off water tanks.

Conveyors, Overhead

Saginaw Standard Conveyor. 42 p., 86 ill. (Catalogue No. 29-CE, 1930 ed., Saginaw Stamping & Tool Co., Saginaw, Mich.) Describes and illustrates various styles of overhead conveying equipment.

Crushers

Best Non-Clog Rock Breakers, Granulators and Pulverizers for Mines, Roads, Quarries, and Milling Companies. 8 p., 12 ill. (Circular No. 7, Best Machinery Co., San Francisco, Cal.) Illustrates and describes various sizes and types of rock-crushing equipment.

Dust Collectors

Dry Dust Collectors. 4 p., 5 ill. (By-Products Recoveries, Inc., New York City.) Explains the principle and design of dust-collecting equipment particularly adapted to cement and gypsum mills.

Explosives

"Dynamite at School." 2 p., 4 ill. (*The DuPont Magazine*, Oct., 1929, E. I. DuPont de Nemours & Co., Inc., Wilmington, Del.) Explains the practices followed at colleges in demonstrating the proper use of dynamite.

Lumber, Roofing

Proper Air Seasoning—An Important Factor in the Processing of Awlco-ized Roof Plank. 4 p., 3 ill. (Processed Lumber Co., Elizabeth, N. J.) Describes the process used in seasoning roof planking.

Oils, Internal-Combustion Engine

"Flash and Fire—What Is Their Value for Motor Oils?" 4 p., 1 ill. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Discusses the value of various tests commonly applied to oils for internal-combustion engines.

Power-Plant Operation

Why You Should Use Flow Meters. 32 p., 32 ill. (Brown Instrument Co., Philadelphia, Pa.) Discusses the value of flow-meter control in steam generation.

Power Plants

"What Is the Life of Power-Plant Equipment?" 2 p. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Discusses some of the factors determining the useful life of boilers and engines.

Production

"Equalizing Production in Spite of Seasonal Demands." 3 p. (*Houghton's Black and White*, Oct., 1929, E. F. Houghton & Co., Philadelphia, Pa.) Part II of a discussion of the problems involved in attempting to maintain steady production.

Safety Appliances

Everything for Mine and Industrial Safety. 158 p., ill. (Catalogue No. 4, Mine Safety Appliances Co., Pittsburgh, Pa.) Describes and illustrates lamps, water stills, detonator cases, rock-dust distributors, mills, fire trucks, respiratory equipment, masks, respirators, emblems, signs, helmets, gloves, clothing, first-aid supplies, etc.

Shovels, Steam

Marion Type 450, 1¼-Cu. Yd. Excavator—Steam. 18 p., 25 ill. (Bulletin No. 339, Marion Steam Shovel Co., Marion, O.) Describes and illustrates mechanical details of a new type of excavating machine.

Signs

Stonehouse Signs for Accident Prevention. 64 p., ill. (Catalogue No. 3, Stonehouse Signs, Inc., Denver, Colo.) Illustrates and quotes prices on hundreds of stamped metal signs useful about plants, pits, and quarries.

PERSONAL MENTION

Leonidas L. Moe died recently at his home in Denver, Colo. He was born at La Crosse, Wis., in 1868 and moved to Colorado in 1882. At the time of his death he was treasurer and a director of the Mountain Cross Granite Company with quarries at Salida, Colo. He is credited with the invention of ramps as used in garages.

George Alfred Goodenough, professor of thermodynamics at the University of Illinois since 1911, died suddenly on September 29. He was 61 years old. Professor Goodenough was graduated with the degree of bachelor of science from Michigan Agricultural College in 1891 and later did postgraduate work at the University of Michigan and the University of Illinois. The latter institution conferred upon him the degree of master of engineering in 1900. Among text books of which he was the author are "First Course in Calculus," "Principles of Thermodynamics," and "Properties of Steam and Ammonia."

Alfred F. Smith has been made vice-president of the several Monolith companies, including Monolith Portland Cement Company, Monolith Midwest Portland Cement Company, Monolith Portland Gulf Company and Monolith Corporation. Prior to becoming an official of the four concerns named, Mr. Smith was chairman of the executive committee of the Monolith Portland Cement Company of California, having been elected to that position last April following his purchase of a substantial interest in the companies.

J. S. Patrick of Burlington, Vt., is president of the new American Minerals Corporation which operates silica mines at Black Fox, Tenn., formerly worked by the Southern Minerals Corporation. His son, **R. L. Patrick**, is treasurer.

Arthur P. Burke, 52, president of the Atlanta Sand and Supply company for the past 25 years, died October 1 in Charlotte, N. C. He had been on a business trip to Washington, and was taken ill on the train en route for home. Mr. Burke was a pioneer in the washed sand industry and was one of the organizers of the Atlanta Sand and Supply company, which was a charter member of the National Sand and Gravel Association, and had taken an active part in the affairs of that body. During the early days of the association he was an active executive director, and served on its War Service Committee during the World War. He was a prominent member of the local Masonic fraternity, and also stood high in the Scottish Rite.

Joseph J. Schedel, of the Stephens-Adamson Company, Aurora, Ill., is spending a few months in Europe, studying practices the pits and quarries.

J. O. Arnold is president of Standard Rock Asphalt Company, San Antonio, Tex. He reports that his company is installing a new plant with a capacity of 300 tons of rock per hour.

George M. Demorest has been appointed by the Palmer-Bee Company of Detroit, Mich., as Pittsburgh representative. He has enagged in sales promotion work on speed reducers, power transmission and conveyor equipment for over twelve years, being one of the pioneer sales engineers in this field. He was originally connected with the Robins Conveying Belt Company, and in more recent years with a well-known manufacturer of power transmission machinery and speed reducers.

John G. Staack has been appointed by the Secretary of the Interior as chief topographic engineer for the U. S. Geological Survey to succeed **Claude H. Birdseye**, who has resigned to accept a commercial position. Mr. Staack has served continuously in the Geological Survey for 25 years, except while, for two years, a captain in the Corps of Engineers during the World War. He has had wide field experience, his assignments covering the entire field of topographic and geodetic engineering in many parts of the United States, and also administrative experience as chief of the Great Lakes section with supervision over the mapping in four states.

F. R. Ritchie is in charge of the Vancouver, B. C., distributing warehouse of the Standard Gypsum Company.

W. H. Hunter, formerly at the Davenport plant of the Dewey Portland Cement Company, has been transferred to the Wichita office, in charge as assistant sales manager. He will be assisted by **C. A. Huffine, V. D. Hawkins, J. M. Hardman, F. W. Foresman**, and **W. W. Zimmerman.**

Scott Turner, director of the United States Bureau of Mines, sailed from San Francisco, Cal., October 10, to attend the World Engineering Congress in Tokio, Japan, which will be held from October 29 to November 7. Following the appointment of President Hoover, then Secretary of Commerce, as honorary chairman of the World Engineering Congress for the United States, Mr. Turner was appointed by Mr. Hoover as one of the five Federal engineers who are to represent the United States Government at this Congress.

Mr. Turner also holds a commission to represent the American Committee of the World Power Conference, for which he serves on four sub-committees. He has been named as the official delegate of the Canadian Institute of Mining and Metallurgy, and has been designated as the official representative of the University of Michigan, and of the Michigan College of Mining and Technology, of which he is a graduate. He has also been listed as a member of the official party representing the American Institute of Mining and Metallurgical Engineers at the Congress.

Don E. Francisco owns a small limestone quarry about two miles south of Fort Atkinson, Wis., but he writes that his quarry and kiln are idle.

Joe Neal has recently undertaken the superintendency of the new plant of the Idaho Portland Cement Company at Inkom, near Pocatello, Idaho. **C. F. Pinkerton** is assistant chemist.

Charles Piez, chairman of the board, Link-Belt Company, Chicago, has been elected president of the American Society of Mechanical Engineers for 1930. The following were elected vice-presidents: **Paul Doty**, St. Paul, Minn.; **Ralph E. Flanders**, Springfield, Vt.; **Ernest L. Jahncke**, assistant secretary of the Navy and president of Jahncke Service, Inc., New Orleans; **Conrad N. Lauer**, Philadelphia, Pa.

Col. Glenn S. Smith has resigned as engineer in charge of the Atlantic division of the topographic branch, U. S. Geological Survey, but he will retain a part-time connection as a special representative in certain important matters. He will be succeeded by **Albert Pike**, who has had long service in the topographic branch.

W. S. Keith, Seattle manager for the Standard Gypsum Company, has severed his connection with that company after five years' service. Prior to joining the staff of this company he was Washington state manager for the Pacific Lime Company, Limited, for eight years, and four years local manager for the Cowell Lime and Cement Company.

INSURANCE PROBLEMS DISCUSSED

Insuring Brains

A prosperous, well-managed plant with which I am familiar last year earned net profits of $18,000 on an invested capital of $100,000. The owners say they "made eighteen per cent on their money" and marvel at the ease with which capital multiplies itself.

But looking more deeply into the facts, we see at once that these owners do not state the story correctly. Their $100,000 did not create a profit of $18,000. Money is only worth what business men in general have to pay to borrow it, or roughly six per cent, because nothing can be worth more than the cost of acquiring it in the open market. In strict truth, then, $6,000 was a return of interest on the invested capital, and the real picture looks like this:

Invested capital..	$100,000
Net profit	$18,000
Return on capital.....	6,000
Profit due to other causes.	$12,000

What factor was responsible for the extra $12,000 of profits?—brains. Everything over and above the normal interest rate represents the fruits of superior executive ability. Profits are not produced by machines, workmen or dead capital; they are produced by those "key men" in each plant whose skill and vision direct the operations.

Now a very strange situation existed in this $100,000 plant. The owners carried full fire insurance covering the physical property which furnished only one-third of their profits. They carried workmen's compensation insurance to protect the ordinary employees, who without machines and supervision would have earned nothing. But they did not carry any insurance at all on the lives of the sales manager and plant superintendent whose personalities and individual ability produced two-thirds of the profits.

Carnegie's Opinion

Andrew Carnegie said that the greatest business loss he could suffer would be to lose the associates who had helped to build his organization. The material part of the business might be obliterated, but if his captains and lieutenants remained, credit was available, ready and eager to help replace the buildings and labor. But personality, the keynote of America's industry today, cannot be replaced.

When death strikes your plant it will carry with it the human skill and ability. What death takes cannot be duplicated, but business insurance upon the life of that man would indemnify his firm for the financial loss.

The use of life insurance for protecting future profits is quite generally known. I kept a record of all the firms called on by salesmen in my agency last year and found that one-third were already fully covered by business life insurance. This number is more surprising because our boys only called on small and middle-sized firms; with large corporations the carrying of life insurance is practically universal. Bankers and mercantile credit agencies now include this protection as one of the essential features in analyzing statements, and it is regarded as a necessity by those who are most familiar with the intricacies of modern finance.

The thing to be insured under a business life policy is the estimated commercial value of brains. This may apply to the chief executive of a corporation (however large or small) the sales manager, and the production manager. These are the men whose personality counts. Their efforts have built up the organization, and the uninterrupted flow of dividends depends on their continuous service.

How to Measure Loss

Now, what does the death of a "key man" mean to a corporation in cold dollars and cents? Some firms just pick out a convenient lump sum, like $10,000, $25,000 or $100,000, and recognize the principle by carrying an arbitrary amount on each officer. However, it is almost always possible to make a fairly exact appraisal of the value of an employe's brains, and you should buy business life insurance with almost as much definite knowledge of the possible loss as you have in buying fire insurance on a building.

To illustrate the method of estimating the money value of the loss of brains, let us determine how much insurance we should carry to indemnify a corporation for the loss of a sales manager (or any executive whose chief work is selling). In the first place, every salesman has his own personal trade contacts. There are certain customers whom he secured through friendship, or whom he "knows how to handle just right." Many of these might swing over to a competitor in the event of his death, and the profit on their business would constitute a direct loss. In the second place, every key man is in some way an executive directing the work of others. He may be in charge of the entire operations, or he may run one department. In either case his loss means disorganization. The man you promote or hire to take his place will take from six months to two years just to master an important job, and five years will elapse before the new man has his entire organization functioning with perfect smoothness. For a death at the top causes upheavals all the way down the line. Some employes may not like the new boss and quit; some may be jealous because they were not promoted. The new boss may bring in friends of his own who, however capable they may be, are "green" at the new work and have to take time to grow into it. This general loss of efficiency is usually figured to be from two to five times the annual salary of the executive whose life is being insured.

There is also a simple general rule for measuring the insurable value of a business man's brains. That is to estimate the share of the company's annual profits which are due to his personality and multiply by five. An individual's personality is ordinarily missed in a corporation for about five years after his death.

The $100,000 corporation referred to at the beginning of this article is managed by two men of nearly equal ability. Therefore, of the $12,000 annual profits created by the brains of management $6,000 is attributable to the personality and services of each head man. Under our rule the $6,000 loss would continue for five years, making a total monetary loss of $30,000. Indeed, if the stockholders should take out a life insurance policy for $30,000 on either of these executives they would find that they were almost exactly indemnified in the event of his death.

Ordinary Life Policy

There is no special form of policy sold exclusively for business purposes. A corporation could, if it wished, buy "term" insurance (for a short period of years only), ordinary life, twenty-payment life or even endowment insurance, as far as the rules are concerned. Corporation insurance just takes a standard policy form and makes the proceeds payable

to the company instead of to the wife or estate of the insured. There is also no difference in rate or requirements about medical examination as between business and personal protection.

The ordinary life policy (also called "straight life" or "whole life") is the predominating favorite for corporation purposes. It carries a fairly low initial rate and if the dividend is used to reduce the premium the annual cost diminishes steadily. The ordinary life contract will be attractive to most firms. The principal exception is in the case of new corporations that are cramped for working capital. For these it is sometimes advisable to buy a five-year term policy or its equivalent. This gives the immediate protection at a very low cost and can usually be changed over to ordinary life when the firm's finances are stronger.

One technical difference between business and personal life insurance is that the corporation (which is the beneficiary), and not the insured, pays the premium. Therefore all rights under the contract belong to the corporation. If the insured executive retires or resigns his position, the corporation can collect the cash surrender value of the policy. As a general rule the premiums on policies where the corporation is the beneficiary are not deductible expenses for income tax purposes, but in compensation for this, the proceeds of the policy at the employe's death are not taxable income. (The services of life insurance in the case of partnerships or sole proprietorships will be discussed later.)

Sales of Barite and Barium Products in 1928

In 1928 the barium industry in the United States reached new high peaks, as evidenced by the increased sales of crude barite, barium products (ground barite and lithopone), and barium chemicals. Total sales of crude barite were 269,544 short tons, valued at $1,754,924, according to reports made by producers to the United States Bureau of Mines, Department of Commerce. The quantity sold was the highest recorded in the last 10 years. Sales of crude barite were made from 8 States—California, Colorado, Georgia, Missouri, South Carolina, Tennessee, Virginia, and Wisconsin—and of these only three showed decreases as compared with 1927—South Carolina, Tennessee and Virginia. Colorado produced a small quantity of barite for the first time since 1916. Quotations for crude barite during the year were lower than those for 1927, dropping from $8.00 a short ton in 1927 to $6.50 to $7.50 a ton in 1928.

The figures on crude barite sold by producers in Georgia, Missouri, Virginia, and Wisconsin, were collected in cooperation with the State Geological Surveys.

A noticeable feature of the crude barite industry in 1928 was the continued parallel growth in Georgia and Missouri. In the last 5 years sales in Georgia have increased from 71,776 tons in 1924 to 112,316 tons in 1928, and in Missouri from 77,189 short tons in 1924 to 114,274 tons in 1928.

Of the crude barite, both domestic and foreign, consumed in the manufacture of barium products, 63 per cent was used in lithopone, 22 per cent in ground barite, and 15 per cent in barium chemicals.

Foreign crude barite imported for consumption in this country in 1928 amounted to 61,765 short tons, valued at $190,756.

Crude Barite Sold by Producers in the United States, 1927-28

State	1927 Short tons	1927 Value Total	1927 Value Per ton	1928 Short tons	1928 Value Total	1928 Value Per ton
California	13,919	$71,708	$5.15	12,557	$51,502	$4.10
Georgia	94,039	580,300	6.17	112,316	675,509	6.01
Missouri	111,456	797,465	7.15	114,274	810,203	7.09
Nevada	884	3,969	4.49	.....	.....	.....
Tennessee	20,537	129,999	6.33	20,260	150,937	7.45
Other States[1]	13,430	87,477	6.51	10,137	66,773	6.59
	254,265	$1,670,878	$ 6.57	269,544	$1,754,924	$6.51

[1] 1927: South Carolina, Virginia, and Wisconsin; 1928: Colorado, South Carolina, Virginia, and Wisconsin.

Barium Products Sold by Producers in the United States, 1927-28

Product	1927 Short tons	1927 Value Total	1927 Value Per ton	1928 Short tons	1928 Value Total	1928 Value Per ton
Ground barite	57,658	$1,166,294	$20.23	64,425	$1,332,228	$20.68
Lithopone	176,994	17,163,620	96.97	200,468	19,073,914	95.15
Barium chemicals[1]	23,943	1,517,994	.....	30,970	1,869,565	.....
	258,595	$19,847,908	.....	295,863	$22,275,707	.....

[1] Barium chemicals manufactured from barium products bought in open market are not included in table in order to avoid duplication; the total output of barium chemicals is therefore not shown above. 1927: Binoxide, hydroxide, and sulphide; 1928: Binoxide, hydroxide, sulphate, and sulphide

Barium Products

Totals for the barium products (ground barite and lithopone), and barium chemicals, also showed increases over 1927. Combined sales of the barium products and chemicals amounted to 295,863 short tons, valued at $22,275,707. As compared with 1927, sales of ground barite increased 12 per cent in quantity, sales of lithopone increased 13 per cent, and sales of barium chemicals combined increased 27 per cent. The manufacture and sales of lithopone and the combined barium chemicals have increased steadily for the last five years.

Talc Sales in 1928

The total quantity of talc sold by producers in the United States in 1928 was 202,976 short tons, valued at $2,537,994, according to figures compiled by the United States Bureau of Mines, Department of Commerce, from individual reports furnished by producers. As compared with 1927, these figures represent an increase in quantity of 6 per cent, and in value of 14 per cent. The figures comprise 6,360 tons of crude talc, valued at $48,031; 936 tons of sawed and manufactured talc, valued at $70,394, and 195,680 tons of ground talc, valued at $2,419,569. There were 20 producers of talc in 1928, the same as in 1927.

Of the total quantity sold, New York supplied 107,321 tons, valued at $1,504,103, as compared with 94,553 tons, valued at $1,191,453, in 1927; Vermont supplied 52,125 tons, valued at $502,501, compared with 54,688 tons, valued at $503,716, in 1927; and California supplied 17,830 tons, valued at $271,413, as compared with 15,760 tons, valued at $238,755, in 1927. The remainder of the output was produced by Georgia, Maryland, North Carolina, Pennsylvania, and Virginia.

Figures for Georgia, Maryland, New York, North Carolina, and Virginia, were collected in cooperation with the respective State Geological Surveys.

Imports of talc for consumption in 1928 were 27,049 short tons, valued at $579,915. Corresponding figures for 1927 were 25,194 tons, valued at $550,382.

J. L. Shiely, of St. Paul, Iowa, is to erect a sand and gravel washing, storage, and distributing plant at Verendrye, N. D., with a complete power plant, at a total cost of about $125,000.

FINANCIAL NEWS
CORPORATE & BUSINESS

The information contained in these financial pages is given with the understanding that any statement on the part of this magazine or any of its staff, as to the responsibility or standing of any person, firm or corporation, or as to the value of any property or securities is a mere expression of opinion, given as a matter of service to the readers of PIT AND QUARRY, for which no responsibility in any way is to attach to this magazine or to any of its staff.

Bloomington Limestone

A despatch from Austin states that Texas Quarries, Inc., a subsidiary of Bloomington Limestone Co., has been organized for the purpose of operating extensive limestone quarries near Austin and a stone finishing plant in that city. The company will spend approximately $250,000 for the installation of machinery and equipment.

More than 4,000 acres, rich in limestone deposits, in Williamson and Travis counties are either under lease or are owned by the company. A small amount has been quarried near Cedar Park. The quarry is about twenty-four miles northwest of Austin and accessible by highway.

Indiana Limestone

A report just issued by President A. E. Dickinson reports that sales for September were the largest in a year.

The statement follows:

Gross billings	1929	1928	% Inc.
September	$1,344,000	$1,183,795	13

Sales for August of this year amounted to $1,189,795.

General Asphalt Lists Common Stock

Listing has just been sanctioned by the New York Stock Exchange of 413,333 shares of no-par common stock of General Asphalt Co. This is in connection with the capital readjustment authorized by stockholders September 19. Authorized common stock was changed to 1,000,000 shares of no-par value from $100 par.

This will constitute the only capital, the 6 per cent convertible bonds having been redeemed last October 1 and the 5 per cent convertible preferred being called for redemption at $110 a share on December 23.

Of the 413,333 new shares of no-par value, 250,842 shares will be issued in exchange for a like number of shares of $100 par common, 59,158 shares will be issued in connection with the conversion of the preferred stock, of which 39,439 shares are outstanding, and the remaining 103,333 shares will be issued in connection with subscription rights. Common stock of record October 23 were offered the right to subscribe at $50 a share in the ratio of one additional share for each three shares held. The rights will expire on November 27.

The only funded indebtedness of the company and its subsidiaries, in addition to current accounts payable and indebtedness incurred in the ordinary course of business is $280,000 of Barber Asphalt Co. equipment trust series certificates, which represents a reduction from the original amount of $375,000 authorized.

Johns-Manville Corp. Reports Third Quarter Earnings

Johns-Manville Corp. and subsidiaries report for the quarter ended September 30, 1929, net profit of $2,483,300 after expenses and federal taxes; equivalent after dividend requirements on the 7 per cent preferred stock to $3.14 a share on 750,000 no-par shares of common stock. This compares with $1,933,007 or $2.40 a share in the preceding quarter, and $1,722,451 or $2.12 a share in the third quarter of 1928.

Net profit for the first nine months of 1929 totaled $5,522,396, after above charges, equal to $6.84 a share on the common, comparing with $4,095,595 or $4.93 a share in the first nine months of the previous year.

Consolidated income account for the quarter ended September 30, 1929, compares as follows:

	1929	1928
Sales	$17,184,461	$12,531,502
Costs and expenses	14,411,931	10,616,709
Balance	$ 2,772,530	$ 1,914,793
Federal taxes	289,230	192,342
Net profit	$ 2,483,300	$ 1,722,451

For nine months ended September 30.

	1929	1928
Sales	$46,776,102	$34,875,232
Costs and expenses	40,587,315	30,312,352
Balance	$ 6,188,787	$ 4,562,880
Federal taxes	666,391	467,285
Net profit	$ 5,522,396	$ 4,095,595

International Cement Third Quarter Earnings

International Cement Corp., reports for the quarter ended September 30, 1929, net income of $1,360,356 after depreciation, federal taxes, etc.; equivalent to $2.20 a share on the 619,049 outstanding common shares. The company has no preferred stock outstanding. This compares with $1,149,789 or $1.86 a share on the 619,031 shares

CURRENT DIVIDENDS

COMPANY	CLASS OF STOCK	DIVIDEND RATE	HOLDERS OF RECORD	PAYABLE
Alpha Portland Cement	Common	$.75 Qr.	Sept. 25	Oct. 15
Atlas Portland Cement	Preferred	$.66⅔ Qr.	Sept. 21	Oct. 1
American Aggretates Corp.	Preferred	1¾% Qr.	Sept. 20	Oct. 1
American Brick Co	Preferred	$.50 Qr.	Oct. 25	Nov. 1
Bessemer Limestone & Cement	Class A	$.75 Qr.	Oct. 20	Nov. 1
Boston Sand and Gravel	Preferred	$.87½ Qr.	Sept. 22	Oct. 1
Boston Sand and Gravel	Common	$.40 Qr.	Sept. 22	Oct. 1
Bloomington Sand and Gravel	Preferred	1¾% Qr.	.....	Nov. 1
Bloomington Sand and Gravel	Common	$.07½	.....	Nov. 1
Calaveras Cement Co.	7% Pfd.	1¾% Qr.	Sept. 30	Oct. 15
Canada Gypsum and Alabastine	New Stock	$.37½ Qr.	Sept. 14	Oct. 1
Cleveland Bl'drs Supply & Brick	Common	$.50 Qr.	Sept. 22	Oct. 1
Consolidated Oka Sand and Gravel	Preferred	1¾% Qr.	Sept. 27	Oct. 2
Construction Materials	Preferred	$.87½ Qr.	Oct. 19	Nov. 1
Coronet Phosphate Co	.....	$2.00 Qr.	Sept. 14	Oct. 1
Dolese and Sheperd	.....	$2.00 Qr.	Sept. 20	Oct. 1
Dufferin Pav. & Crushed Stone	7% 1st pfd.	1¾% Qr.	Sept. 16	Oct. 1
Ideal Cement Co.	Common	$1.75 Qr.	Sept. 13	Oct. 1
Illinois Brick	.....	$.60 Qr.	Oct. 1	Oct. 15
International Salt Co	.....	1½% Qr.	Sept. 16	Oct. 1
Johns Manville	Preferred	1¾% Qr.	Sept. 10	Oct. 1
Johns Manville	Common	$.75 Qr.	Sept. 24	Oct. 15
Kelley Island Lime and Tr	.....	$.62½ Qr.	Sept. 20	Oct. 1
Kentucky Cons. Stone Co	Preferred	1¾% Qr.	Oct. 15	Nov. 1
Kentucky Rock Asphalt	Common	$.40 Qr.	Sept. 15	Oct. 1
Laclede Clay Products	Preferred	1¾% Qr.	Sept. 29	Oct. 1
Lehigh Portland Cement	Common	$.62½ Qr.	Oct. 13	Nov. 1
Lehigh Portland Cement	Preferred	1¾% Qr.	Sept. 14	Oct. 1
Limestone Products	7% Pfd.	1¾% Qr.	Sept. 15	Oct. 1
Medusa Portland Cement	Preferred	1½% Qr.	Sept. 25	Oct. 1
Medusa Portland Cement	Common	$1.50 Qr.	Sept. 25	Oct. 1
Metropolitan Paving Brick	Preferred	1¾% Qr.	Sept. 15	Oct. 1
Mineral Products Co	Pfd. "A"	$.20 Qr.	Sept. 30	Oct. 1
Missouri Portland Cement	.....	$.50 Qr.	Oct. 19	Nov. 1
Pacific Clay Products	.....	$.60 Qr.	Oct. 20	Nov. 1
Pennsylvania Salt	Common	$1.25 Qr.	Sept. 30	Oct. 15
Pennsylvania Salt	Common	$1.00 extra	Sept. 30	Oct. 15
Santa Cruz Portland Cement	.....	$1.00 Qr.	Sept. 24	Oct. 1
Sterling Salt	Common	$.50 Qr.	Sept. 24	Oct. 1
Superior Portland Cement	Class A	$.27½ M	Oct. 23	Nov. 1
United States Gypsum	Common	$.40 Qr.	Sept. 14	Oct. 1
Warner Co.	1st Pfd.	$1.75 Qr.	Sept. 14	Oct. 1
Warner Co.	Common	$.50 Qr.	Sept. 30	Oct. 15
Warner Co.	Common	$.50 extra	Sept. 30	Oct. 1

in the preceding quarter and $1,417,916 or $2.29 a share on 618,826 shares in the September quarter of 1928.

Net income for the first nine months of 1929 totaled $3,527,764 after above charges equal to $5.70 a share on 619,049 shares, against $3,614,374, equal after preferred dividends (which have since been eliminated) to $5.43 a share on 618,826 common shares in the first nine months of the previous year.

This company is a prominent producer of cement with plants throughout the eastern section of the United States, as well as in Cuba, Argentina and Uruguay. In addition to cement selling under the trade name of "Lone Star" it also manufactures a new quick hardening type called "Incor."

The International Cement Corporation operates thirteen plants with an annual capacity of 20,000,000 barrels. The policy of expansion is shown by the acquisition of two companies last year, and by 200 per cent expansion of capacity in the past four years.

Income account for the quarter ended September 30, 1929, compares as follows:

	1929	1928	1927	1926
Gross Sales	$10,377,104	$10,209,715	$ 8,291,489	$ 8,023,345
Expenses, etc	7,662,534	7,724,661	6,267,392	5,847,356
Depreciation	863,371	616,818	521,480	472,481
Net	$ 1,851,199	$ 1,868,236	$ 1,502,617	$ 1,703,508
Federal Tax, Interest, etc	490,843	450,320	267,644	323,926
Net Income	$ 1,360,356	$ 1,417,916	$ 1,234,973	$ 1,379,582

Income account for the nine months ended September 30 compares as follows:

	1929	1928	1927	1926
Gross Sales	$26,929,929	$25,673,286	$22,133,616	$19,728,514
Expenses, etc	20,104,104	19,365,695	16,767,753	14,554,372
Depreciation	1,932,654	1,608,917	1,315,884	1,190,182
Net	$ 4,893,171	$ 4,698,674	$ 4,049,979	$ 3,983,960
Federal Tax, Interest, etc	1,365,407	1,084,300	766,460	799,421
Net Income	$ 3,527,764	$ 3,614,374	$ 3,283,519	$ 3,184,539

The rapid expansion of net income was checked during the first few months of this year, however, sales are increasing, foreign subsidiaries are running at capacity and returning large profits and the trade situation should be slightly improved before the end of the year by the enactment of tariff duty on foreign cement.

The stock has declined to around 65 from its year's high of 103, but the concern is rather generous to stockholders through occasional issues of stock dividends and rights.

American Aggregates Corp. Eight Months Earnings Report

This company was established in 1904, and incorporated as the Greenville Gravel Co. in 1925. The name was changed to the present title in 1928. American Aggregates Corporation is engaged in the production, preparation, and distribution of gravel and in the manufacture of concrete products. During 1928 the company purchased controlling interests in the Ohio Ballast Co., Redbank Gravel Co. and the Cincinnati Sand and Gravel Co. for $2,500,000, and the sand plants, equipment, and market of the Granite, Sand and Gravel Co. of Indianapolis for about $1,000,000. The company also began building two new plants and completely rebuilt three other plants. Sales of 9,266,020 tons during 1928 was a new record.

On March 1, 1929, seventy-five cents a share was paid on the outstanding common stock. Since that time the directors of the company have taken no action on any further dividend payments.

There has recently become available an earnings statement covering the first eight months of 1929, and although there is no direct comparison with the results for the full year of 1928, it may be observed that less satisfactory results are being obtained this year.

Sales in the first eight months of 1929 amounted to $3,550,493, a good comparison with gross revenue in 1928, the full year, of $4,595,297. However, operating income in the first eight months of 1929 after the deduction of sales, expenses and preoperating expenses amounted to only $727,574, as against operating income of $1,199,586 in the full year of 1928, after charges for depreciation and depletion which are not mentioned in the more recent statement. Earnings this year indicate a margin of operating profit of about 21 per cent, while those for last year indicate a margin of profit of roughly 26 per cent. After the deduction of all additional charges, addition of other income, and deduction of interest and amortization, net profit in the first eight months of 1929 came to $444,486 as against $837,546 in the full year of 1928. Reduced to per share earnings, approximately $3.20 was shown in 1928 and about $1.45 in the first eight months of 1929. The possibility of the company improving its showing this year over last is remote, for operations slow up considerably as the winter season approaches, those in November, December, January, February and March being at almost a standstill.

While the comparison of the balance sheet issued during this year with one as of the close of last year is not altogether a satisfactory one, still we believe that the current treasury position is somewhat weaker than as of December 31, 1928. At that time, total current assets amounted to $1,029,000 and current liabilities to $672,000, while cash was only $46,000, real estate purchase obligations and notes payable amounted to but $57,000. A balance sheet as of August 31, 1929, showed total current assets in the amount of $1,704,814. Current liabilities were nearly equal to these at $1,676,950. Cash amounted to $232,000, but bank notes payable in the amount of $1,180,000 and accounts receivable stood at a rather high figure of $1,219,000 after the deduction of a reserve for bad accounts. Total accounts receivable at the close of last year were only $660,000. Evidently the company felt it necessary to conserve cash resources to take care of current indebtedness by omitting common dividends.

There is no market for the 7 per cent preferred stock but the debenture 6's of 1934 are quoted on the New York Curb Exchange around 95. The common stock is unlisted and is traded in over the counter.

American Aggregates Corp. has its main office at Greenville, Ohio, and its officers are as follows: F. D. Coppock, president; C. E. Patty, vice president and general manager; G. C. Baker, vice president; H. R. Brown, secretary and treasurer.

Penn-Dixie Cement Sales Increasing

A report has just been received from Pennsylvania-Dixie Cement Corp. and subsidiaries. It shows their consolidated net profit for the twelve months ended September 30, 1929, to be $686,072 after depreciation, depletion, interest and federal taxes, equivalent to $5.05 a share on 135,888 shares of 7 per cent preferred stock.

The company's officials stated that there has been an increase in sales volume recently, but continued price reductions by competing companies have seriously affected earnings. Prices in the East were recently reduced twenty to thirty cents a barrel, the most drastic reduction in recent years, and in the Midwest twenty-five to thirty cents. During the twelve

months reported, prices have been reduced twenty-five cents a barrel in the Southwest. Foreign cement continues to have a serious adverse effect on the industry in this country.

The ratio of Pennsylvania-Dixie's current assets to current liabilities as of September 30, 1929, stood at 11 to 1.

Consolidated income account for twelve months ended September 30, 1929, follows: Operating profit, $2,930,414; depreciation and depletion $1,397,257; interest $710,980; federal taxes $136,105; net profit $686,072.

Consolidated balance sheet of Pennsylvania-Dixie Cement Corp. and subsidiaries as of September 30, 1929, compares as follows:

Assets

	Sept. 30, '29	Dec. 31, '28	Dec. 31, '27	Dec. 31, '26
Land, Bldgs., Machinery and Equip...	$25,480,849	$26,511,046	$26,414,798	$26,233,241
Cash	2,332,997	1,573,126	2,949,881	3,454,999
Notes and Accounts Receivable	1,419,154	1,365,536	849,015	1,054,397
Inventories	2,710,614	3,394,902	2,964,915	2,704,145
Miscellaneous Investment	84,100	115,600	118,500	120,500
Insurance Fund	35,000	35,000	35,000	30,000
Deferred Charges	85,959	38,192	37,290	79,878
Total	$32,148,673	$33,033,402	$33,369,399	$33,667,160

Liabilities

Preferred Stock	$13,588,800	$13,588,800	$13,000,000	$13,000,000
*Common Stock	4,000,000	4,000,000	4,000,000	4,000,000
Gold Bonds	11,789,000	11,920,000	12,422,000	12,468,000
Notes Payable	.....	.....	.....	66,821
Accounts Payable	166,756	332,857	194,059	156,278
Accrued Tax, Interest, etc	214,845	414,181	359,872	427,340
Dividends Declared	.....	.....	200,000	.....
Federal Tax Reserves	164,459	283,900	374,746	700,220
Other Reserves	205,637	178,200	542,022	67,523
Surplus	2,019,176	2,315,464	2,256,700	2,790,978
Total	$32,148,673	$33,033,402	$33,369,399	$33,677,160

*Represented by 400,000 no par shares.

General Asphalt Co. Acquisition of South American Properties

Under the recently inaugurated plan of recapitalization, the General Asphalt Co. arranged for the segregation of its large acreage and fee holding of oil properties in Venezuela. These are to be placed in a wholly owned subsidiary of General Asphalt.

The trade hears that one of the immediate moves of this new oil subsidiary will be the acquisition of additional South American oil holdings. One property being mentioned as likely to go into the new Asphalt subsidiary is the Maracaibo Oil Exploration Co., which has large potential oil holdings in Venezuela. On much of its holdings, some of the major oil companies are carrying out prospecting work.

General Asphalt has held, for many years, large acreages in fee in Venezuela, the lease on which are held by the Royal Dutch Shell which operates these properties, and returns General Asphalt considerable oil royalties. In addition Asphalt has some producing acreage which it operates itself.

Canada Cement Co., Ltd.

On October 10, 1929, the Financial Counsel, Montreal, said that the plants of this company had been employed at a high rate of capacity. It was understood that the earnings of the company during the current year were showing improvement over those realized during the first nine months of 1928.

Considerable savings are being realized through the development of its special self-unloading steamer for transportation of its products in bulk between Montreal, Quebec, Halifax, and Saint John, N. B.

A recent despatch said that this new development meant that the company would be able to ship its product in bulk to Maritime provinces for local distribution and bag it at local plants in Quebec, Halifax, or St. John; storage facilities had already been completed at Quebec, those in Halifax were expected to be in commission some time during this month while the plant in St. John would probably be completed early in 1930.

Consumers Company

The stockholders of this company have just officially approved an increase in the common stock to 3,000,000 shares of $5 par from 1,000,000 shares and the issuance of not exceeding $10,000,000 worth of debenture bonds which are to bear interest of not more than 7 per cent and carry common stock voting trust certificate purchase warrants.

This final approval by the stockholders has completed one of the most important consolidations in the building material industry in years.

A despatch from Cleveland said also that this was taken to indicate that the company was preparing to exercise options which were understood to have been held for the acquisition of the A. C. O'Laughlin Co. and the Central Lime and Cement Co. Consumers recently acquired control of the Wisconsin Lime and Cement Co.

Johns-Manville Earnings Estimate

A report from this company states that the third quarter earnings of Johns-Manville may show a gain of as much as 50 per cent over the like period for last year. The third quarter earnings in 1928 were $2.12 a share and this would mean that the per share earnings for this year would approximate $3.

Any increase in building construction in the future will cause further expansion of the company's sales and earnings.

Raybestos-Manhattan

A report by Raybestos-Manhattan, Incorporated, and subsidiaries shows that their net earnings for the quarter ended September 30, 1929, amounted to approximately $1,300,000 after all deductions and taxes.

This company was formed very recently by the merger of the Raybestos Company, the United States Asbestos Company and the Manhattan Rubber Manufacturing Company. The new corporation has 676,012 no-par shares of common stock outstanding which represents their sole capitalization.

Based on this number of shares, the above earnings report equals $1.92 a share for the third quarter. This compares with $1.70 a share in the June quarter and $1.40 a share in the first three months of the year.

It was also stated that production of the company has been sold out into January.

Alpha Portland Cement Co. Earnings Report

We have just received certain figures covering the year ended June 30, 1929, and although this company closes its fiscal year December 31, and comparative items for the preceding twelve months are therefore lacking, still we think the report below is of interest.

Year Ended June 30, 1929

Net sales	$13,424,100
Operating expenses	9,741,567
Depreciation	1,254,313
Operating Profit	$ 2,428,219
Other income	274,169
Total income	$ 2,702,388
Federal taxes	327,020
Net income	$ 2,375,368
Preferred dividends	140,000
Common dividends	2,133,000
Surplus for period	$ 102,368
Earned per share preferred (20,000 shares)	$118.76
Earned per share common (711,000 shares)	3.14

It might be added that sales are just about the same as for the fiscal

year ended December 31, 1928, but that the net profit is about $200,000 smaller. This would indicate, of course, that the first half of 1929 was not as profitable as the first half of 1928. The cement business has been encountering some difficulties both from the decline in building activities and from foreign competition. There is a possibility that the tariff measure now pending before Congress will include benefits for the cement companies. In any event, Alpha's facilities are quite well diversified so that it would not feel the adverse effects in any one or two single sections. The company has ten plants altogether, located at Martins Creek, Pa.; Alsem, N. Y.; Jamesville, N. Y.; Manheim, W. Va.; Birmingham, Ala.; Ironton, O.; Bellevue, Mich.; La Salle, Ill.; St. Louis, Mo., and Phoenixville, Ala. The combined rated capacity of these plants is about 12,500,000 barrels per year, but in 1928 the output amounted to 9,000,000 barrels. The company produces entirely gray portland cement. Its mills are of modern construction and its natural resources are sufficient to last on the average for many years. Any factors which would have a bearing upon the strengthening in cement prices or stimulation of consumption would certainly be of considerable value to this company.

The consolidated balance sheet as of June 30, 1929, disclosed a good treasury position. Total resources were over $33,000,000 of which property account was carried at a depreciated value of $22,480,000.

Current assets of $9,808,000 compared with current liabilities of $1,483,000.

With cash, call loans and Government bonds of over $5,600,000, it may be seen that the balance sheet position is a strong one. Capitalization of the company consists of 20,000 shares of 7 per cent preferred stock, par $100 a share, and 711,000 shares of no par common stock with a carrying value of $24,134,000 and an equity in surplus of $4,645,000.

As was stated in the last issue of PIT AND QUARRY, the 711,000 outstanding shares of Alpha Portland common stock has just been listed and admitted to trading on the New York Stock Exchange.

International Cement Co.

As a result of recent cut in cement prices in certain sections of the country, officials of this company reduced their estimates of 1929 earnings to be about $7.25 per common share, compared with $8 previously. In 1928 the company earned $5,149,388, equal to $7.90 per common share.

It was also pointed out that International Cement Company's earnings would not be greatly affected by the present price war as eleven of its plants were located in territories outside of the competitive areas. Only the New York and Pennsylvania plants would feel the full force of the conditions, and production of these plants amounted to about 3,250,000 barrels, one tenth of the output for the year. International was said to be running its mills in New York and Pennsylvania at full capacity and was meeting all competition.

Although the Norfolk, Va., mill of the Lone Star Cement Co., Inc., a subsidiary, was closed down for an indefinite period, still demand for the company's special cement "Incor" was holding up well and two other mills were running at full capacity on this product. Demand was so large, in fact, that the company was finding it necessary to equip other mills to make this product in order to overcome freight differential.

The company announced that the Louisiana State Highway department had awarded a contract for 11,000,000 bags of cement to the Louisiana subsidiary of the company and Vice President Dwight Morgan stated that it was deemed advisable to close the Norfolk mill because low-priced foreign cement was being admitted duty free under the present tariff schedule.

Dufferin Paving and Crushed Stone

Toronto advices said that this company has just secured a contract from the county of Welland for paving and road construction work. The amount of the contract aggregated $250,000.

International Salt Co.

Standard Corporation Records reports that they were informed by interests close to the management that the company's net for the first seven months of this year approximated $412,000 before Federal taxes, equal to about $6.75 per share on 60,711 shares. Net profit for the first half totaled $231,299, equal to $3.81 per share. Indications were that the net for the full year would run close to $10 per share, compared with $7.23 in 1928.

Bond tenders have been asked for an amount of this company's first and consolidated collateral trust 5 per cent bonds, due October 1, 1951, sufficient to exhaust $90,671, until 12 M. October 11, 1929 at not exceeding 105 and interest by the Chemical Bank and Trust Co. of New York.

General Asphalt

The company has just announced that it has made application to the New York Stock Exchange to list 413,333 shares of the company's no-par common stock.

Duquesne Slag Products

The stockholders of this company have just approved an increase in the capital stock from 17,000 to 25,000 shares.

Idaho Ceramic Materials

This company recently certified to the Secretary of State at Olympia, Wash., that it had increased its capital from $275,000 to $500,000.

Calaveras Cement Co.

This company announced that the common and preferred stock were ready for delivery in the form of permanent certificates at the office of the company in San Francisco.

New Corporations

Salmon Sand Co., William E. Sandmeyer, Newark, N. J. $100,000.

Limestone Dust Corp., P. F. Yankee, Mgr., Pocahontas, Va. $50,000. C. Henry Harman, Pres., Tazewell, Va.; James Elwood Jones, V. P., Switch Back, W. Va.; L. B. Crawford, Sec.-Treas., Pocahontas, Va.

Rillito Sand & Gravel Co., Tucson, Ariz. $100,000. C. F. Zinsmeister, M. F. Benham.

Smith Sand & Gravel Co., Inc., Orlando, Fla. $10,000. J. Wesley Smith, I. H. Smith, W. W. Lottridge.

Stony Creek Gravel Co., Willows, Calif. $200,000. Edward Lowe, Jr., San Francisco, Calif.; Howard Smith and Herbert S. Twede, both of Willows, Calif.

Jones Sand Co., 12 N. Third St., Columbus, O. $25,000. Harmon A. Jones, Newton M. Jones. To mine and market moulding sand.

Belle Chaney Sand & Gravel Co., Turkey Creek, La. $30,000. J. P. Barnett, Pres.; F. C. Barbour, V. P. & Supt.; Albert Tate, Sec.-Treas. & Gen. Mgr.

Sunrayed Limeshell Products Co. Chas. A. Ferguson, Pres., 96 Dexter St., Malden, Mass.; James M. Collins, V. P., 233 Fellaway East, Malden, Mass.; Dominick Morley, Treas., 16 Colonial Ave., Waltham, Mass.

Sierra Gypsum Products Co., Ltd., Vernon, Los Angeles, Calif. $250,000; 5,000 shares com.

California Nevada Sierra Madre Co., 812 Chester Williams Bldg., Los Angeles, Calif. $1,000,000. To produce sand and gravel at Douglas Flat, Calif.

LEGAL INFORMATION FOR OPERATORS

When Breach of Contract Entitles Other Party to Repudiation

The law is well established that where two parties enter into a valid contract by the terms of which each agree to perform definite acts, a breach of the contract by one party entitles the other person to immediately sue and recover damages.

For instance, where a purchaser fails to accept and pay for non-metallic products legally ordered, the seller may recover the profits he would have earned had the purchaser fulfilled the terms of the contract. Also, where a purchaser agrees to pay for goods by installments, his failure to promptly make any payment entitles the seller to sue and recover the full balance due immediately.

However, all contracts of this nature are legally known as bilateral agreements, or ones in which *both* contracting parties agree to perform definite acts or things. It is important to know that this law does not apply to *unilateral* contracts, or those by the terms of which *only one* of the contracting parties is obligated.

In Clarey v. Security Portland Cement Co., 279 Pac. 483, a money lender loaned to a cement company $5,000 on a contract in which the latter agreed to repay the loan monthly with interest at 6%, at the rate of five cents per barrel of cement sold. The cement company failed to pay to the lender the money due a certain month for the cement sold the previous month, and the latter filed suit to collect the whole amount due, with interest for the original term of the loan. The lower Court held the cement company liable, but the higher Court reversed this verdict, saying:

"It is often stated as if it were a requisite in the formation of contracts that there must be a mutuality. This form of statement is likely to cause confusion, and, however limited, is at best an unnecessary way of stating that there must be a valid consideration. In unilateral contracts there is never mutuality of obligation; and in bilateral agreements, though it is necessary that there shall be such a promise on each side as will furnish valid consideration, to express the idea by saying that mutuality is necessary is sure to cause confusion with the use of the same word by Courts. . . . We find nothing uncertain in the terms of the agreement. It was clearly the intention that the defendant (cement company) should pay each month a sum equal to five cents per barrel of cement produced during the preceding month, this amount to be applied, first, to the payment of interest at the rate of 6 per cent per annum, and the balance, if any, upon the principal of the loan. . . . In the present case the production of cement was the contingency upon which depended appellant's obligation both as to the amounts of the installments to be paid and their maturity. This obligation, however, being unilateral, a failure to pay an installment at maturity would not give the promisee (lender of money) the right to consider the contract repudiated and to recover payment in full contrary to its terms."

Ordinance Restricting Operation of Quarry and Rock Crusher Void

It is well established law that a reasonable ordinance prohibiting operation of certain classes of businesses is valid and enforceable. However, any law of this nature which is unduly oppressive is void.

For illustration, in People v. Hawley, 279 Pac. 136, it was disclosed that a company conducted a stone quarry and a rock crusher within the city limits. Certain citizens instituted legal proceedings and requested the Court to declare the business a legal nuisance and issue an injunction against its further operation, in view of a city ordinance which prohibited this class of businesses in the city. The Court promptly held the ordinance void, stating the following important law:

"Ordinances having that effect must be reasonable, and must be for the purpose of protecting the public health, comfort, safety, or welfare. Every intendment is to be made in favor of the lawful exercise of municipal power making such regulations, and it is not the province of Courts, except in clear cases, to interfere with the exercise of that authority. . . . Therefore, notwithstanding this general grant of power, it is a thoroughly well settled doctrine that municipal by-laws and ordinances undertaking to regulate useful business enterprises are subject to investigation in the Courts, with a view to determining whether the law or ordinance is a lawful exercise of the police power; or whether, under the guise of enforcing police regulations, there has been an unwarranted and arbitrary interference with the right to carry on a lawful business, to make contracts, or to use and enjoy property. . . . Any ordinance or said city which would enjoin and prohibit the company from thus using its property is therefore void, as an unreasonable restraint upon the use by it of its property and an unwarranted interference with the right of said company to carry on a lawful business and to use and enjoy its own property."

When Bonding Company Is Relieved from Liability

It is important to know that any seller of non-metallic products may by certain acts relieve a bonding company from liability on a contractor's bond to pay for materials purchased by the latter.

For instance, in Johnson v. Flynn, 15 S. W. (2d) 327, it was disclosed that a contractor entered into a contract with a city to do certain work. In order that he might be able to furnish the bond required, a man named Johnson, who had sold the contractor the cement to be used on the job, wrote the Southern Surety Company, advising that if the bond were made he would "not hold the Southern Surety Company liable for anything the contractor may owe, and that this release is given for the express purpose of inducing the Surety Company to execute the bond."

Later when the contractor defaulted in making the payment, Johnson sued on a mechanic's lien and attempted to hold the bonding company liable. However, the Court held Johnson not entitled to payment, saying:

"Johnson might have maintained an action on the bond executed by the contractor, but he waived this right as an inducement to the surety company to make the bond. He has therefore no rights superior to any other creditor."

Legal Construction of Contractor's Bond

In West v. Detroit Fidelity & Surety Co., 225 N. W. 673, a contractor furnished a bond containing the following clause:

"Said Interstate Construction Company shall in all respects fulfill its said contract according to the terms and tenor thereof, and shall faithfully discharge the duties and obli-

gations therein assumed, and shall pay for all labor, equipment, gasoline, oils, materials and supplies used or employed on said contract."

Litigation developed when the sellers of materials endeavored to hold the bonding company liable for the contractor's debts. The bonding company attempted to avoid liability on the grounds that a considerable portion of the supplies were not actually used in the construction work.

However, the Court promptly held the bonding company liable for all materials sold personally to the contractor and used by the employes.

Agreement Guaranteeing Freight Rates Is Valid

While it is true that a contract is invalid by which a common carrier agrees to deliver merchandise at a lower rate than that scheduled in the tariff, yet contracts of this nature are valid with respect to individuals.

For example, in Monk v. Johnson, 16 S. W. (2d) 985, a person agreed to purchase from a company all of the gravel required by him at the price of forty-five cents per ton f.o.b. the cars. The freight rate was 5½ cents per cwt.

Later a man named Monk informed the purchaser that he could purchase gravel at the same quoted price with a guarantee from the gravel company that the freight rate would not exceed 5 cents per cwt. Then Monk agreed to supply gravel to the original purchaser under a guarantee that the freight rate should not exceed 5 cents per cwt.

Litigation arose when Monk was compelled to pay 5½ cents per cwt. and he endeavored to compel the purchaser to pay this amount. However, the Court held Monk entitled to recover on the freight basis of 5 cents per cwt., saying:

"While the parties could not fix the freight rate, they could, and did, contract on a basis for gravel which assumed the freight rate to be lower than it actually was."

Employer Liable for Injury Caused by Fellow Workman

Generally speaking, an employer is not liable in damages for an employee's injuries caused by a common fellow workman from purely accidental circumstances. However, the employer is liable if the injury is caused by negligence.

For instance, in Newark Gravel Co. v. Barber, 18 S. W. (2d) 331, it was disclosed that a workman employed by the Newark Gravel Company was injured when a workman failed to give a proper signal to avoid the danger. The injured workman sued the gravel company for damages. The latter contended that it was not liable because the injury resulted from an inevitable accident.

However, the Court held the gravel company liable since the injury resulted from negligence of the fellow workman, saying:

"The undisputed proof shows that it was customary for the man behind to give the signal before the tie was thrown, and the undisputed proof also shows that the warning or signal was not given at the time of workman's injury. . . . The men were working together, and each had a right to expect that his fellow workmen would exercise due care in the premises for the safety of the others."

Wheeling Material and Unloading Cars Similar Work

It is important to know that an employer always is liable for injuries received by a minor whose parents did not consent to the employment. Moreover, the law is well established that an employer is liable in damages where a minor sustains injuries while performing labor more dangerous than the work consented to by the parents.

For illustration, in the case of Hammack v. Hope Co., 140 S. E. 1, it was disclosed that a young man, under sixteen years of age, sought employment as a common laborer to shovel and wheel non-metallic products. At the time of the employment the father consented to his son wheeling in a wheelbarrow materials used by the company.

Without consulting the father the employer instructed the boy to unload several cars containing rock, gravel and asphalt. While unloading the cars an accident occurred resulting in the death of the son. The father sued the employer for $5,000 damages contending that when the employer changed the son's employment without obtaining the former's consent, he automatically became liable in damages for the injuries sustained.

The lower Court held the employer liable, but the higher Court reversed this verdict, on the sole grounds that unloading material from cars is no more dangerous than the work of shoveling and wheeling, saying:

"Though the work of unloading cars may have been somewhat more hazardous than some of the other work performed, yet who but common laborers could be expected to unload cars? Work of all kinds thus performed in conjunction with other laborers equipped with such implements are fraught with dangers, but these are regarded as assumed in accepting the employment. . . . We think that the employment of the deceased as a common laborer necessarily included the unloading of cars."

Must Prove Source of Injury

Generally speaking, an employer is not liable for payment of compensation for an injury sustained by an employe, unless the testimony proves *conclusively* that the injury was sustained while the workman was performing some duty *within the scope of the employment.*

For instance, in Berry v. Industrial Commission, 167 N. E. 26, it was disclosed that an employe, while using a hammer and chisel, was struck in the eye by some particles of concrete. He consulted a physician who removed some of the particles from his eye. Several days later while chiseling a bolt on his own automobile a piece of steel lodged in his eye, and he again consulted a physician. Soon afterward his eye became infected and it was necessary to remove it.

He sued the employing company for damages contending that the injury resulted from the first accident which occurred while he was engaged in his regular employment. However, the Court held the employe *not* entitled to compensation, saying:

"The evidence fails to satisfactorily show that the loss of Childs' (employee's) left eye resulted from an accidental injury which arose out of and in the course of his employment."

What Constitutes Net Profits?

What constitutes net profits of a corporation has been variously defined. In the very nature of things the diverse character of operation of non-metallic plants, and the differing circumstances under which the questions involving profits are raised, a variety of definitions of this term are to be found.

However, it is interesting to observe that in Corporation v. Faubion, 18 S. W. (2d) 737, the Court gave the general rule, as follows:

"It is, what remains in the conduct of a business after deducting from its total receipts all the expenses incurred in carrying on the business. . . . To such expenses may be charged taxes, upkeep, depreciation, and interest on the corporation's debts, but *not* interest on its capital. As a general rule any loss in the capital stock must be replaced before estimating earnings."

TRAFFIC NEWS AND COMMENT

Cement

Southwestern Lines Docket No. 18517 involves proposal by Central Freight Association lines for establishment of rates from C. F. A. territory to Southwestern Lines territory on same basis as prescribed by the Interstate Commerce Commission in I. C. C. Docket No. 16845 reported in Vol. 144, I. C. C. reports at page 585.

I. C. C. Docket No. 16845 covers rates from certain producing points in the states of Kansas, Oklahoma, Texas, Missouri, Alabama, Georgia, Tennessee, and Kentucky to destinations in the states of Louisiana, Arkansas, Mississippi and Tennessee.

In this proceeding a mileage scale was prescribed, of which the following are representative:

	Cwt.
100 miles	11½c
200 miles	15 c
300 miles	17½c
400 miles	20½c
500 miles	22½c
600 miles	25 c
700 miles	27½c
800 miles	30 c
900 miles	32½c
1,000 miles	35 c
1,100 miles	38 c
1,200 miles	40 c

Shipper Proposes Reduction in Rates on Sand and Gravel from Troy, Ohio

Request has been filed for reduction in rates from Troy to various stations on the Sandusky and Indianapolis Divisions of the Big Four and to Cincinnati Northern Railway Stations.

The following are typical of reductions sought:

To—	Proposed Rates Per Ton
Bowlersville, Ohio	$0.75
Urbana, Ohio	.80
Huntsville, Ohio	.90
Kenton, Ohio	1.00
Gretner, Ohio	.90
Pemberton, Ohio	.95
Dawn, Ohio	1.05
Union City, Ohio	1.15
Celena, Ohio	.95
Coldwater, Ohio	.90
Ansonia, Ohio	.80
Farmersville, Ohio	.85
Franklin, Ohio	.90

Central Freight Association docket 22958 covers this proposal.

Fullers Earth Rates

Producers of Fullers Earth shipping from Attapulgus, Dry Branch, Georgia, and other Georgia and Florida shipping points are seeking lower rates to various consuming points in Pennsylvania and West Virginia.

The rate sought from Attapulgus to Bradford, Pa., is $9.00, and to Parkersburg, W. Va., $8.60. Corresponding rates from other shipping points are also sought. Southern Freight Association Docket 47432 covers the above subject.

The same producers (in Southern Freight Association Docket 47433) propose readjustment of existing rates to Gulfport. The rates proposed by the carriers are as follows:

From—	To—	Proposed Rates
Attapulgus, Ga. Jamieson, Fla. Midway, Fla. Quincy, Fla.	Pensacola, Fla. Mobile, Ala. Gulfport, Miss. New Orleans, La.	Per Ton $4.50
Superior, Fla.	Pensacola, Fla. Mobile, Ala. Gulfport, Miss. New Orleans, La.	Per Ton $5.40
Dry Branch, Ga. Pikes Peak, Ga.	Pensacola, Fla. Mobile, Ala. Gulfport, Miss.	Per Ton $4.95

Moulding Sand

Illinois Freight Association Docket No. 5253 proposes adjustment of the following rates from Iola, Illinois (rates per ton):

To—	Present	Proposed
St. Louis, Mo.	$2.30	$1.32
E. St. Louis, Ill.	2.30	1.32
Belleville, Ill.	2.10	1.56
Decatur, Ill.	2.20	1.44
Springfield, Ill.	2.30	1.20
Quincy, Ill.	3.00	2.04

Sand, Gravel, Pebbles, Crushed Stone & Slag

Interstate Commerce Commission Docket No. 22596—Sub. 2 covers complaint filed by the Philadelphia Slag Company in which discrimination and prejudice is alleged between points in Pennsylvania, New Jersey, Maryland and Delaware.

Agricultural Limestone

The Kansas City Southern Railway by Texas-Louisiana Tariff Bureau Docket No. 2715-LA propose to establish rules permitting the stopping in transit of agricultural limestone to be unloaded at locations between stations on its line in Louisiana. Charges to be based upon the freight rate to the first regular station beyond the unloading point plus $6.30 per car. Not less than ten carloads on any one train will be handled under this arrangement.

Powdered Gypsum

(Not Calcined)

Joint Conference Docket No. 286 proposes cancellation of the existing commodity rates on this commodity within Southern Freight Association Territory, also between points in that territory on the one hand, and points north of the Ohio and Potomac rivers on the other hand. It is proposed to substitute the land plaster rates. In the absence of land plaster rates, it is proposed to apply combination rates.

Carriers assigned for hearing at Cincinnati, October 22nd.

Sand

Blast, Core, Engine, Filter, Fire or Furnace, Foundry, Glass, Grinding or Polishing, Loam, Moulding or Silica.

The Central Freight Association lines in their Docket No. 22863 propose to readjust rates from stations on the Nickel Plate Road between Westfield and Lakeview, N. Y., to Rochester, N. Y., and points taking same rates.

The following illustrate the proposed adjustment (rates per ton):

From—	To—	Present	Proposed
Westfield Lakeview	Rochester	$2.30	$1.50
	Batavia	2.30	1.30
	Attica	2.30	1.20

Haydite, Clay or Shale Cinder

At the request of a shipper, the Transcontinental Freight Bureau has reopened its Docket No. 10,089, which was a proposal to provide same rates on Haydite as on a number of other aggregates and manufactured products such as blocks, brick, dolomite and rock.

Lime

Interstate Commerce Commission, I. & S. Docket No. 3,364, suspends proposed revision of rates on lime from certain points in Tennessee, Virginia, West Virginia, Maryland, and Pennsylvania to destinations in Tennessee, Virginia, and North Carolina which, in some cases, involve increases and, in others, reductions.

This proceeding will be subject of hearing at which the shippers and carriers can present evidence. On the record made, a finding will be entered by the I. C. C.

Cement

Docket No. 22,675 covers complaint filed with the I. C. C. by Darragh Company attacking as unreasonable the rates on cement from points in Missouri, Oklahoma, Kansas, and Texas to points in Arkansas.

Docket No. 22,676 covers complaint filed with the I. C. C. by G. A. Lerper & Company attacking as unreasonable the rates on cement from points in Alabama and Tennessee to Arkansas.

REVIEW OF FOREIGN PRACTICE

Drill for Sampling Quarry Products

For the comprehensive sampling of pit and quarry products small hand power diamond drills are recommended. These are now used by miners for sampling of mineral deposits. The advantages of the drills are cheapness, accuracy, mobility and simplicity. In testing a coal deposit in Brazil, drilling to a depth of 300 feet, the cost was 87c per foot. Naturally such depths are unnecessary for limestone, clay, chalk, etc. For sampling hard crystalline limestone the diamond set bit is necessary. Drilling speed with this bit rarely exceeds 1 foot per hour. For drilling in chalk or clay, the diamond bit is not required and a core is not obtained, but slurry only. A crew of four men and a foreman are required to run the machine and its mobility is such that it can be erected and dismantled in half an hour. The heaviest piece weighs 180 lbs. and the weight of the whole is less than one ton. The gear case and rod holder are mounted on a hollow-steel tubular frame, and the drill can be set to bore at any angle. Fig. 1 shows the machine. A Reid-Kellett (*Cement and Cement Manufacture*, July 1929).

Development of Mineral Deposits in Russia

Largely as a consequence of the efforts of the Superior Council of National Economy of the U. S. S. R. to increase its exports and decrease its imports, many new deposits of nonmetallic minerals have been located and are being exploited. Russia is now the principal source of the kaolin used in Poland, formerly supplied by England. In the vicinity of Murmansk there will be built a plant for the treatment of apatite so as to stimulate the Russian exports of feldspar. Deposits of talc still need a good deal of prospecting before they can be exploited on a large scale. A mineral much used in Russia, a clay called "floridine," used principally in the oil industry, has heretofore been imported largely from the United States, but deposits of floridine have been discovered in the republic of Georgia and a plant for grinding this clay is now being built at Koutais. New deposits of amianthus asbestos have been found, and it has been determined that the deposits of this mineral in the Caucacus region and Siberia could be put into exploitation on short order

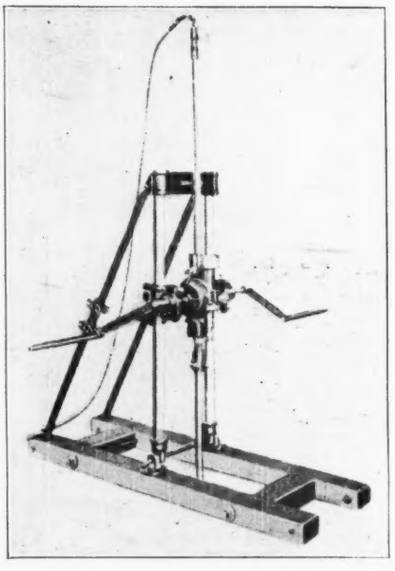


Fig. 1

for the production of 2,000 to 3,000 tons a year. Other researches have located large and workable deposits of graphite and of cinnabar in Central Asia. (*Revue des Materiaux de Construction*, Aug. 1929, pp. 316-7).

"Workability" of Concrete

At the July meeting of the French Society for Testing Materials (Association Francaise pour l'Essai des Materiaux), R. Feret, head of the laboratory for roads and bridges at Boulogne, read a communication recommending the adoption of the term "workability" from American practice as French lacks a word completely covering this notion. He defines workability as the aptitude of a concrete for being worked and put in place with a minimum of effort and time, and expresses its nature by the formula, $\frac{C+E}{S+P}$, where C, S, P, E are respectively the quantities of cement, sand, coarse aggregate and water, the relationship $\frac{E}{C}$ determining the strength of the concrete and $\frac{S}{P}$ its consistency. After reviewing the various methods devised for determining or testing workability, chiefly in American and German practice, he concludes that none of them is entirely satisfactory, but that the results obtained seem certainly to show that for every mixture of solid materials there is a proportion of water giving a maximum workability, and that its workability is the greater the higher the proportion of cement is to the inert materials. The most useful point would be to define the granulometric composition to give to the mixture to obtain the concrete most easy to work without excessive consumption of cement or lowering of such qualities as strength and compactness. One should also distinguish the ability of concrete to resist separation during transport (cohesion) from its ability to be poured into forms with a minimum of effort (plasticity). (*Revue des Materiaux de Construction*, Aug. 1929, pp. 287-9.)

Japanese Cement Industry

At the beginning of 1929 Japan had 32 cement plants with a maximum annual capacity of 30,132,000 bbl. This capacity is expected to reach 36,000,000 bbl. with the construction or enlargement of plants at Onoda, Oita, Fujiwara and Tokyo. Probably half the annual output will be exported; Korea is one of the most favorable markets, and the Asano company is considering the construction of a plant in Korea. Among the new Japanese projects are a 900,000-bbl. plant for the Tokyo Cement Corp. in the suburbs of Tokyo, for which American and Danish equipment has been purchased by the Oriental Engineering Co.; a 1,000,000-bbl. plant at Tokushima for the Onoda Portland Cement Co., construction of which has begun; and plants at Miyl and Gifre for the Fujiwara Railroad Corp., each with a capacity of 1,000,000 bbl. (*Revue des Materiaux de Construction*, Aug.. 1929, pp. 317-8).

Classification and Some Uses of Limes

Vicat classifies limes as follows:

Class A—Rich or Fat Limes.

Class B—Poor or Lean Limes.

Class C_1—Slightly or Feebly Hydraulic Limes.

Class C_2—Moderately Hydraulic Limes.

Class C_3—Eminently Hydraulic Limes.

Class A or Fat Limes slake rapidly and energetically, and have their volume doubled or more in the process; their consistence remains sensibly the same after many years of immersion in water under the conditions of the test; and they dissolve practically completely in pure water frequently changed. Class B or Lean Limes slake slowly, with little or no increase in volume. Class C_2, moderately Hydraulic, set in 15 to 20

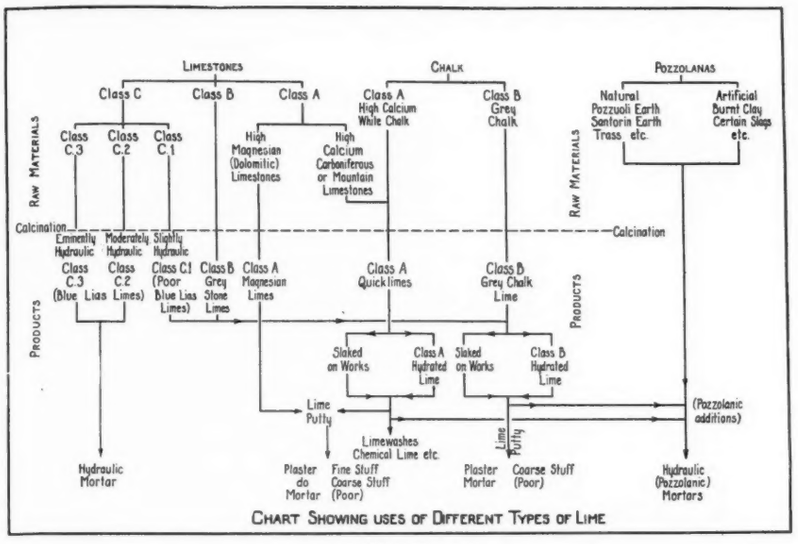


CHART SHOWING USES OF DIFFERENT TYPES OF LIME

Fig. 2

days after immersion and continue to harden; after 6 or 8 months the process becomes slow. After one year their consistence is about that of hard soap. They dissolve in water with great difficulty. Class C_1 or Feebly Hydraulic are intermediate between C_2 and B. Class C_3 Eminently Hydraulic set at some time between the second and fourth day of immersion. After one month, they are already very hard and altogether insoluble. At six months, they appear like absorbent calcareous stones splintering under a blow and presenting a slaty fracture.

"Limewashes" besides whitewash, distemper, calcimine, etc., there are cold water paints which have calcium caseinate as their essential ingredient. "Lime plasters" include not only the straight lime-sand-hair variety but also straight lime-putty gauged with plaster of Paris, etc. "Lime concrete" include mixtures of sand and larger aggregates with hydraulic limes or with high calcium limes and pozzolanic material. Lime is also used in the manufacture of sand-lime bricks, the manufacture of "natural cement" by actually *sintering* an Eminently Hydraulic lime (Class C_3). These, of course, are only a few of the large number of uses of lime, and these mentioned are especially applicable to the building industries. The chart shows the sources and uses of various limes. (Fig. 2.) A. D. Cowper (Dept. Sci. & Lud. Res. Bldg. Res. Spec. Report No. 9).

Effect of Zinc and Zinc Oxide on the Hardening of Cements

After substituting some laboratory tables with sheet-zinc tops for some covered with sheet iron, chemists at the Ebange blast-furnace cement plant (France) discovered in their routine tests a phenomenon of expansion amounting at times to a complete disintegration of the briquettes immersed in water. Consequently, to study the effect of the zinc itself or one of its compounds, M. Pujol prepared a series of blast-furnace cement mortars and iron-portland cement mortars with the addition of a variable quantity of zinc oxide, the proportion of ZnO being figured in percentage of the dry mortar. On the blast-furnace cement, with 1 per cent, 0.5 per cent and 0.1 per cent ZnO the briquettes disintegrated in water; with the infinitesimal dose of 0.01 per cent ZnO the briquettes did not disintegrate, their 2-day strength was a little diminished and their 28-day strength was normal. On iron-portland cement, the mortar with 0.1 per cent ZnO hardened a little more slowly, but its strengths were normal. In general, it seemed safe to conclude that zinc oxide, even in traces, has a harmful effect on the initial set of cements with slag base; so far as the mixing of mortars on the zinc tables is concerned, it was concluded that the results were possibly due to action of free lime on the metallic zinc, but more probably to the presence of oxidized zinc at the surface. The effect of the ZnO is reminiscent of the studies on the effect of oxide of lead that have recently been made.

In a similar series of tests on other varieties of cements, M. Rengade found that ZnO had no perceptible effect on the setting time or strength of fused cement (*ciment fondu*). However, on Lafarge cement with a normal initial set of 4 hours 45 min. final set of 11 hours 40 min., and 2, 7 and 28-day tensile strengths of 12.8, 28.8 and 30 kg./sq. cm., respectively, the addition of 1 per cent ZnO (to weight of the cement) gave initial set of 21 hours 10 min., final of 42 hours, and strengths of 0, 29.8 and 40; with 0.1 per cent ZnO, the corresponding results were 7 hours, 19 hours 45 min., and 7-day strength of 17 kg. On lime, the set was much slower, and strength was somewhat reduced, but not so much as on the cements. On grappier cement there was an *acceleration* of the initial set but a retardation of the final set and a diminution of the strength. Rengade also noticed considerable variation in results on cements of the same type but from different plants. (*Revue des Materiaux de Construction* Aug. 1929, pp. 289-291).

The Ternary System Lime-Carbon Dioxide-Silica. An Investigation of the Manner of Hardening of Lime Mortar

Hardening of lime mortar occurs in two stages, drying and carbonation. The first may take only a few hours. Analyses of mortars up to 2500 years old shows that carbonation is not complete even in that time. The presence of MgO results in less absorption of CO_2. Liberation of CO_2 from $CaCO_3$ by active forms of SiO_2 occurred at 873 degrees but not at room temperature. Quartz did not show appreciable action on $CaCO_3$ at 800 degrees. X-ray examination showed $CaCO_3$ but no $CaSiO_3$ in mortars 580 and 970 years old. Tables of analyses of 5 mortars aged 430 to 970 years are given. Talc did not form $MgCO_3$ at 80 lb. CO_2 pressure in 6 hours at 200-400 degrees.—G. F. Hüttig and Emil Rosenkranz.

Simple Determination of the Water Requirement of Poured Concrete

The consistency required for practical purposes is determined with a piece of chute mounted on pipe frame so that its angle of inclination may be adjusted to any desired degree. A charge of 3 liters of the wet batch to be tested is emptied into the top of the 15 meter chute and is caught below to be measured. When the material adhering to the chute is 0.7-1.0 liter the batch has desirable consistency and H_2O content.—A. Guttman (*Zement* 17, 1794-5, 1928). C. A.

Temperature and Corrosive Salt Solutions

Test cubes of cement mortars were exposed to solutions of ammonium and sodium sulphate at various temperatures. It was found that test pieces prepared under identical conditions and stored in salt solutions of the same concentration exhibited different behavior at slight differences in temperature.—E. Probst and K. E. Dorsch (*Zement*, Sept. 5, 1929).

LATEST NEWS FLASHES

New Sand and Gravel Plant In Grants Pass

The Wilcox Sand & Gravel Company, which has located its crusher plant on the Rogue river, has an unusually complete equipment. The plant, in process of construction, is capable of delivering to the 15 bins a capacity of 300 cubic yards of gravel per day. The gravel, taken from the bed of the Rogue river, is carried by cable into a large hopper on the river bank from which it falls on to an endless belt and is carried to the top of the plant.

When completed the plant will contain equipment for the production of duntile, building blocks, brick, tile and concrete products. The mixers and sorters will be located on the second floor and the mixture will be drawn off into molds located on the first floor.

William J. Kuntz Organizes Lime and Hydrate Plants, Inc.

A new company, to be devoted to meeting present-day requirements in lime kiln and hydrator design, construction and operation, has been organized by William J. Kuntz. The new company has secured a charter and will operate under the title "Lime and Hydrate Plants, Inc." Its business offices are at 2 E. Market Street, York, Pa., and Duluth, Minn. The company is already actively engaged in the business of building modern lime and hydrate plants. For the present its specialties, which are covered by letters patent, will be manufactured in local and other shops.

Wm. J. Kuntz, president of the new concern, together with C. J. Jones, chief construction engineer, are at the present time erecting a 100-ton Kuntz gas-fired lime plant for the Moosehorn Lime Company's operations at Moosehorn, Manitoba, Canada, which contract is well under way. This contract will entail an expenditure of approximately $150,000. Into this plant will be embodied many new features in the application of a practice, which in itself, is new in shaft-kiln gas-fired lime construction—the result of the organization's constant contact with plants of this type, of which type four plants are successfully operating in this country.

Instead of burning lime as it is commonly burned by use of hand-firing bituminous coal from side furnaces in shaft kilns, a gas-producer plant will be installed which will generate the gas and the lime will be burned in shaft kilns in a process similar to the way the various gas companies make gas and pipe it to the burners of the housewives' stoves.

William J. Kuntz

Since 1895, when A. P. Brommel, and his organization, of which Mr. Kuntz was a part, introduced an innovation in the shape of steel shaft kilns, instead of a kiln of stronger construction for lime burning, there has been a steady, though slow development of the processes for burning lime.

In his experience during 28 years in the lime business, Mr. Kuntz has had contact with all types of construction in the United States, Canada, Porto Rico, and South America, and has spent considerable time abroad studying present-day processes in France, Germany, Belgium, Austria, and England. The new organization is new in name only, since its members have been identified with this development for more than 30 years.

Link-Belt Company Ships 14½ Miles of Conveyor Chain

What is believed to be one of the largest single shipments of conveyor chain ever made was recently shipped from the Indianapolis Plant of the Link-Belt Company to the New Burns, Oregon mill of the Edward Hines Western Pine Company. This shipment consisted of 76,950 feet or 14½ miles of conveyor chains. Weighing 250,000 pounds, this chain was shipped in 3 cars. A large quantity of Roller and Silent Chain for transmission purposes was also shipped to this mill.

Gardner-Denver Company Secures Larger Offices

Due to recent increases of business in the New England states, the Gardner-Denver Co. last week moved its New York branch office from 30 Church st. to larger quarters at 147 Varick st. The new quarters afford space for both office and warehousing purposes.

The company manufactures slush pumps, air compressors, high-pressure drill-steel forges, rock drills and drill sharpeners. Its plants are located in Denver, Colo., Quincy, Ill., and La-Grange, Mo.

Canadian Company Modifies Its Preferred Stock

Supplementary letters patent were granted to the Canadian Rock Products Company, Limited, modifying the company's powers in respect to the preferred stock.

Sand and Gravel Plant Near Vancouver, B. C.

The new sand and gravel company organized this past summer by Louis A. Hill of New Westminster, B. C., Canada, and entitled Hill Sand and Gravel Company, began operations September 17, and is producing about 150 cu. yd. per day.

Busy Season at Eau Claire

The Eau Claire Sand & Gravel Company, Eau Claire, Wis., reports an unusually busy season this year, necessitating two shifts, shipments of their products having reached as high as 73 cars per day. Additional property recently acquired, to be developed in the near future for operation next year, will add greatly to production.

Erie Stone Company Buys Logansport Firm

Purchase of the Logansport Lime and Stone Company, a $175,000 concern, by the Erie Stone Company of Huntington, Ind., was recently announced by Charles W. McKee, president of the latter organization.

Mr. McKee, it was stated, will take charge of new interests November 1.

The property includes six lime kilns at Logansport with a capacity of 300 tons a day. The plant will be improved to produce fifty cars a day.

Peter Martin, who has been operating the Logansport plant since 1909, announced that he would retire.

The Erie Stone Company has been in operation twenty years. The offices of the new corporation will be maintained in Huntington.

Will Reopen Feldspar Mines

J. H. McKinney has leased the Lick Ridge feldspar mines near Bakersville, N. C., from the owner, W. Vance Brown and E. C. Guy and will install new equipment necessary to reopen and operate them.

Bluffton Plant Will Not Be Rebuilt

According to the Cleveland *Plain Dealer*, the Bluffton plant of the National Lime and Stone Company, which burned recently at a loss of more than $300,000, will not be rebuilt. The company has eight other plants that have more favorable shipping costs.

French Year-Book of Quarries

l'Annesaire des Carrieres et des Industries Annexes de France has appeared in its 1928-29 edition. This contains a directory of operators of quarries and similar industries, arranged geographically and by industry. It sells for 43 francs.

Southwest Road Show

The Fifth Annual Southwest Road Show and School will be held in Wichita, Kan., February 25 to 28, inclusive, 1930. Nine states had exhibits at the 1929 event. Lectures and discussions will be given by authorities in their respective lines.

Palmyra Lime Company Reorganized

G. W. Dinsmore and Art Powers have reorganized and will resume operation of the Palmyra Lime Company, at Palmyra, Tenn. The company has been inactive for about five years.

Danish Cement Tank Ship

Denmark has a new ship designed especially to transport bulk cement. According to information received by the U. S. Department of Commerce, the cement will be carried in specially designed tanks, from which discharging will proceed through the medium of suction pumps. Both loading and discharging operations will be extremely rapid. The seven tanks with which the vessel will be fitted will hold a total of 1,400 tons of cement. The propelling machinery will consist of two Fairbanks-Morse Diesel motors developing a total of 800 hp. and designed to give the vessel a speed of 11 knots.

Idaho Portland Plant Kept Busy

This new plant, that was described in detail in the September 11 issue of PIT AND QUARRY, is operating steadily with an average production of five carloads daily. President Simons reports that sales are keeping pace with the output. The McDonald Engineering Company of New York has been given a contract to erect concrete silos having storage capacity of 75,000 barrels of cement. Mr. Simons says: "Among our large customers are the United States reclamation department, the highway department of Idaho, and the highway department of Montana. We are supplying the cement for a large paving project in Butte and, to date, have managed to sell our output without a regular sales organization. However, we are preparing to set up a sales organization and widen our field of distribution."

Lime Equipment Firms Consolidate

H. Miscampbell Company of Duluth has consolidated its interests with the interests of W. J. Kuntz of York, Pa. The new corporation will manufacture the improved Clyde hydrator, which will be installed as a dustless hydrate lime operation using the Kuntz system of hydrate lime separation. The offices of the corporation will be at Duluth, Minn., and at York, Pa.

There is much room for improvement in the lime industry, which had its beginning in the old-fashioned pot kiln. Many manufacturers are using methods of burning and hydrating their lime that are almost as antiquated. The general use of modern and efficient lime-burning and hydrating equipment will do much towards producing a better product and bringing the lime industry once more to the front, to assume its rightful place in the building industries; and this organization hopes to play an important part in the bringing about of this much needed change.

The improvements in lime-burning and hydrating equipment as worked out by this organization are applicable to all existing kilns and hydrate plants in the country. This fact gives this organization a tremendously large field in which to work.

H. Miscampbell is the pioneer of hydrating machinery in this country, and his company is still in the lead and intends to make more and radical improvements in that line. The H. Miscampbell Company also builds milk-of-lime and ready-mixed mortar plants, equipment for the hairing of hydrate for making ready-mixed mortar, and dust-collecting devices for lime and cement plants.

The company is at present engaged in the installation of an improved Clyde hydrate plant for the Mt. Frome Lime Company of Sydney, Australia, and a 4-kiln, 100-ton gas-producer lime plant in Manitoba. Under the new arrangement, users of the Clyde hydrator will be enabled to install accessories to make their hydrate plants dust-proof and to eliminate excessive power demands from their operations. Repair parts for the Clyde hydrator will be carried in stock at Duluth, Minn., and at York, Pa. A plant will be built at York to make all of the specialties of the corporation.

Ship-loading Conveyors at Manistee

The Manistee Sand and Dock Company has put into service its new conveying system for loading sand into lake boats. The company has spent about $150,000 in building the dock and apparatus, and expects to ship upwards of one-half million tons of sand annually. The first ship to be loaded by the new system was the Fontana.

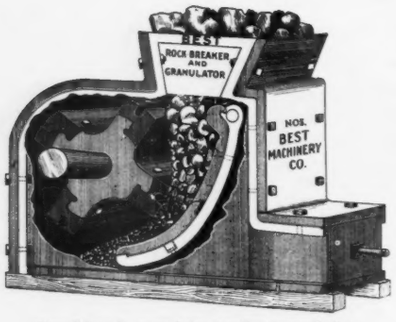
Pioneer Sand Company Builds New Office Building

By November 1 the Pioneer Sand office will be moved from the little two-room frame office building which has been in use since the company was started, into its 30-ft. by 40-ft. brick and concrete office building. Captain R. J. Stewart will have a pilot house built on the top of the new building so he can watch the river work conveniently.

Spontaneous Coalpile Fire in Lime Plant

At about ten o'clock Sunday morning, September 15, when few men were about, fire was discovered in a coal pile in one corner of the large plant of the Campbell Stove Company at Afton, Mich. Volunteer firemen succeeded in quelling the conflagration only after it had done much damage.

NEW MACHINERY AND SUPPLIES



Combined crusher and granulator

This Machine Crushes and Pulverizes Rock

The Best Machinery Company, San Francisco, Cal., manufactures the machine shown herewith and known as a rock breaker and pulverizer. It is designed especially for the reduction of non-metallic rocks such as granite, quartz, dolomite, limestone, cement rock, shale, fluorspar, feldspar, and phosphate.

All bearings are of substantial roller design, well protected from grit or dust, with positive lubrication. One feature of this machine is its adaptability to wide variations in the kind and size of material handled. The claim is made that it will not clog. It will do the work of a crusher and secondary rolls, in one operation. This machine is recommended for quarries where pulverizing is required. It will take rock of man-size and reduce it as fast as the rock can be fed systematically to it. All parts are of steel and guaranteed against breakage in normal service. The shoes on the revolving member are easily replaced.

There is a size of machine to fit any demand. Any size can be adjusted to produce any desired fineness of product. The No. 5 size shown in the cut has a feed opening 8-in. by. 16-in., weighs 3,000 lb., and requires 9 to 15 hp. It will reduce 200 to 300 tons of tough, hard rock per day from feed size to ¼-in. or even 20-mesh.

A New Thew Product

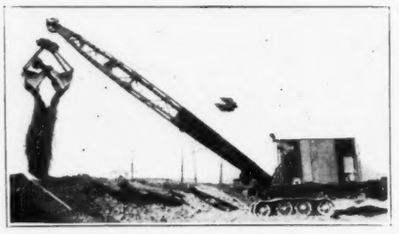
The Lorain-45, a new ¾-yard capacity shovel, crane, clamshell and dragline is announced by The Thew Shovel Company, Lorain, O., supplementing its present line of products, the 1-yd. Lorain-55 and the 1¼-yd. Lorain-75. The basic design and construction principles of the Lorain-55 and Lorain-75 units are reflected in the new Lorain-45, which is built to the Thew center-drive design in turntable, truck and shovel boom. The superstructure or turntable is powered by a Waukesha type H. S. motor with 5½-in. bore, 6½-in. stroke, developing 71 hp. at 1,000 r.p.m.

The power transmission consists of a silent-chain drive carrying the power directly to the center drive pinion. This pinion meshes directly with the three power shafts—the hoist, swing, and crowd or travel shafts and constitutes the entire power transmission of the Lorain-45. Each of these three power shafts is independently controlled through a large internal expanding-band clutch. Each shaft may be separately engaged with the full power of the motor applied to it; or any combination of these shafts may be effected for simultaneous operations.

This superstructure is mounted on a two-speed Thew center drive crawler, similar to the Lorain-75 mounting but modified for the ¾-yard capacity. A vertical travel shaft, and a horizontal propelling shaft comprise the major crawler drive. All the propelling gears and steering clutches run in a constant oil bath in a heavy steel crank-case placed high to afford generous ground clearances. The steering clutches of the crawler are mounted on splined shaft sections, an innovation.

Crawler high-travel speed is 1½ m.p.h., climbing a 15 per cent grade; low speed is ¾ m.p.h., climbing a 30 per cent grade. Both speeds are available for travel in either direction with equal efficiency, regardless of the length of travel. A full range of boom equipment for shovel, crane, clamshell and dragline units is furnished. The shovel boom is the Thew center drive shovel boom in which the shipper shaft is placed at the center of the boom, or further ahead and in a lower position, permitting the dipper stick to attain a greater vertical angle. This enables the Lorain-45, with an 18-ft. shovel boom and standard 14-ft. dipper-stick, to dig and

Lorain shovel



Lorain clamshell crane

dump higher, and to reach farther out, than any other shovel equipped with same length of boom and dipper-stick.

The shovel boom is an all-steel, full box-section of great strength. The dipper stick is an all-steel, welded, rectangular section with a patented "far-reach" greenhorn at one end.

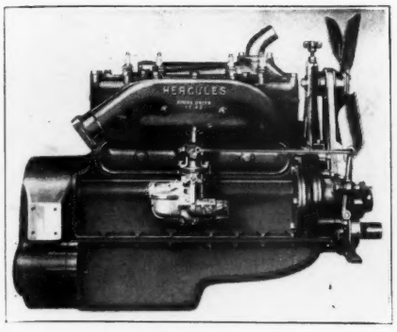
Hercules Develops Heavy-Duty Low Horsepower Engines

To meet the growing demand for heavy-duty power in the lower horsepower ranges, the Hercules Motors Corporation, of Canton, Ohio, has developed the OO series of four-cylinder engines. Built in three models, the OO series engines embody the characteristics of the famous Hercules OX series engines, of which they are smaller counterparts. The OO engines are not designed for a single purpose, but are completely developed for universal application.

The OOA, OOB and OOC models, which comprise the OO series, have bores of 3½-in., 3¾-in. and 4-in., respectively, and a common stroke of 4½-in. They are identical in general design, and the majority of the parts are interchangeable among the different models, the only difference being in the bore sizes and the parts affected thereby. All the models develop maximum torque at 1,000 r.p.m. and peak at 2,200 r.p.m.

To meet present-day operating conditions calling for sustained high speed, special consideration has been given to valve cooling. The water is conducted from the water pump directly across and through the block and distributed into a passage immediately between the valves and the cylinders. The valves are thus completely surrounded by water. As a further aid to valve cooling, the valve guides are brought up close to the valve heads.

Lubrication is full force feed. The pump is located beneath the center main bearing and driven from the



Heavy-duty engine

camshaft by spiral gears. The shafts and gears of the oil pump are case hardened, insuring long life to this unit. Oil pressure can be adjusted easily to suit operation requirements.

Crankcase ventilation is provided by a breather cap located directly over the accessory drive shaft. This opening also serves for filling the oil sump.

As in all Hercules engines, the OO series models have the crankcase cast integral with the block. The pistons are of cast iron and carry three rings above the pin. The lower of these rings is an oil regulating type. Piston pins are of nickel molybdenum steel and are 1 in. in diameter. Each pin is securely locked in its connecting rod by a clamp bolt, and operates in two hard cast bronze bushings in the piston. Connecting rods are of the H section and have a center-to-center length of 8 in.

The engines are of L head arrangement and the valves are the usual 45 degree set type. The exhaust valves have a clear diameter of 1⅜ in. and the intakes of 1½ in. They are operated by mushroom type tappets of nickel molybdenum steel.

Binks Company Announces New Hurley Unit

The Binks Manufacturing Company, 3114 Carroll Avenue, Chicago, announces the completion of an all-purpose utility spray painting and finishing outfit, known as the Binks New Hurley Unit. This outfit is being manufactured on a large production basis for general utility work such as touching up, refinishing, repainting, and lacquering practically any product within an organization. It is a complete unit equipped with a full-size quart all-metal container and a new Binks pressure cup spray gun supplying an atomized flat spray four inches in width.

The air-compressor unit is belt-driven and connected to a ¼-hp. General Electric motor. This unit has a capacity of 2.16 cubic feet of air per minute.

Paint-spraying apparatus

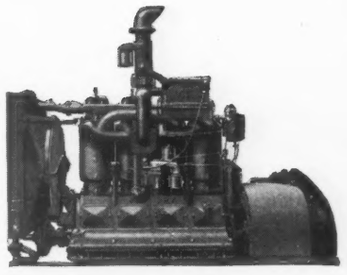
The outfit is sturdily constructed. A rib cast-iron air container is mounted between the motor and the compressor on a pressed metal base, all of which is mounted on rubber feet. The cylinder and base are cast in block of seasoned grey iron and accurately machined. Ten feet of rubber covered electric cord, attachment plug, and ten feet of durable braided rubber air hose are attached to the outfit. The unit is complete, ready for use upon delivery. The inexperienced or experienced operator merely plugs the electrical connection into a nearby light socket, places the material into a quart pressure container, and starts to work.

Northwest Introduces New Oil Engine

The Northwest Engineering Company, 28 E. Jackson Blvd., Chicago, builders of gasoline, oil-burning and electric shovels, cranes and draglines, announces a new oil-burning engine for crane and shovel service. This new engine is based on gasoline-motor principles, having the usual ignition system. Its essential features are:

1. The proper development of carburetor apparatus for low-grade fuels, resulting in accurate metering.
2. Adequate vaporization of the heavier fuels to permit clean burning under extremely varying conditions of load, which are characteristic of crane and excavator operation.
3. Special combustion-chamber shape which promotes clean combustion, together with suppression of undue detonation.
4. Special means for the elimination of lubricating oil dilution which otherwise would accompany the use of oils heavier than gasoline.

Welding with torch



New oil engine

The engine is free from complicated metering devices or pumps. Because its operation is identical to that of a gasoline motor and is understood by any operator or truck driver, the manufacturers claim gasoline motor dependability. Maintenance and care can be accomplished in the normal way without the necessity of special mechanics.

The new device has been found to reduce fuel consumption approximately 10 per cent, and, as it burns fuel that can be purchased for much lower prices than gasoline, it is the source of highly important operating economy. Fuels of a character suitable for the engine have a distillation range which extends from 195 deg. C. initial point to 365 deg. C. end point. This type of oil is readily available and, in most districts, can be bought without ordering in tank-car lots.

The engine is started from cold on gasoline for which a small tank is provided. A valve switches the fuel after a few minutes running.

Lengthy Plant Shutdowns Not Necessary

Nothing irks a retail merchant more than slow delivery on an article that is in popular demand or strictly seasonal in merchandising value. Very often in a moment of exasperation he cancels his order from the tardy manufacturer and orders from another who will give him prompt delivery on the date specified.

Today there is no excuse for a manufacturing concern to find itself in such a predicament for any length of time. With the introduction of the oxy-acetylene welding process as a means of plant maintenance and repair, most progressive plants now employ a welder. This artisan is usually a very busy person, for it is surprising the amount of work that comes to his attention during the course of a day.

The repair of a crank shaft here described is typical of the kind of work that he is called upon to do. The plant where this welder was employed was in heavy production at the time, and his knowledge and skill in effect-

ing a speedy repair saved many hundreds of dollars for his employers.

The illustration shows a 5½ in. crank-shaft which broke through the crank-pin. As the original was only 3⅝ in. long, only a small knob projected. It was chamfered to a double V with the cutting blowpipe, and the surface carefully cleaned with a cold chisel and a wire brush. The shaft was then secured to a heavy leg of the welding table in a vertical position, and the end section leveled and blocked in position with 3⅝ in. between the cranks. When it had been trued up, five ½-inch. stay bars exactly 3⅝ in. long were cut and tack-welded to the throws. This was done to make the welding easier, and to keep the pieces rigid while the shaft was being turned and moved around.

When the stay rods were welded, a ½-in. weld was made at the center of the chamfer and then the section to be welded was laid down horizontally and thoroughly preheated. Welding was done through a hole in the asbestos paper covering. The hot metal facilitated the completion of the job, and minimized the local effect of the welding flame.

After the shaft was welded—the pin being built up so that it could be subsequently machined to size—it was annealed in order to relieve the last traces of internal strain. Machining was the last step in the repair.

Jeffrey Absorbs Bakstad

The Jeffrey Manufacturing Company, Columbus, O., recently announced the purchase of the Bakstad Crusher and Equipment Corporation, Chicago, Ill. The acquisition of the Bakstad crusher rounds out the Jeffrey line of reduction machinery, making it possible for the Jeffrey plant to furnish a machine to meet almost every reduction requirement. Hereafter the Bakstad crusher, which has the unique three-jaw principle of reduction, will be manufactured and marketed by the Jeffrey Manufacturing Company.

In Canada, the sale of the Jeffrey Bakstad Crusher will be handled through the Jeffrey Manufacturing Company, Ltd., which has its head office at Montreal and a branch office at Toronto.

Electric Bench Grinder

The Black and Decker Manufacturing Co. of Towson, Maryland, has just brought out a new 6-in. ball bearing portable electric bench grinder.

Black & Decker engineers have been working long toward the perfection of this machine to meet the demand for a quality ball bearing grinder within the price range of the 6-in. and 8-in. sleeve bearing tools. The anti-friction bearings make it much easier to maintain wheel speeds under load.

This grinder is for use on alternating current only, maintaining a 3600 r.p.m. spindle speed on 60-cycle current and 3000 r.p.m. on 50-cycle current.

Portable Stable Arc Welder

The new Lincoln stable arc welder mounted on the McCormick-Deering tractor is announced by the Pontiac Tractor Company of Pontiac, Michigan.

This unit is furnished in either the 200 or 300 ampere machine and gives a wide range of utility.

The extension frame in this mounting is such that the tractor is simply set into a 4-in. I-beam frame and the front axle assembly is set ahead under the frame, thereby lengthening the wheel base. This construction reinforces the tractor and gives it balance, making it easy to steer with the added weight. The welder unit complete with the panel is mounted on this frame member ahead of the tractor and takes its drive from the power pulley at the side of the tractor by a belt. This makes a compact self-contained unit capable of moving about under its own power. The 48x4 dual tires used in the rear give this unit a road speed of 15 miles per hour.

Determination of Components in Wet Concrete

Upon the assumption that there are definite strengths attending various specifications for the kinds and amounts of the several materials used in mixing concrete, Prof. Walter Dunagan of Iowa State Agricultural College has worked out a simple scheme to determine the ultimate or 28-day strength of any raw concrete mixture. Such a scheme becomes increasingly useful as the purchase of ready-mixed concrete continues to attract contractors. These men must rely upon the faithful fulfilment of the contract specifications, but they have not known any means whereby they could make a check upon the mixtures that are delivered to their jobs.

The new scheme is so simple that one is surprised by it and wonders why it has not been used before. By it, the ingredients in a raw mix can be ascertained in a short time with very simple apparatus. We intend to describe this scheme again and at more length after Prof. Dunagan releases it through the Journal of American Concrete Institute, but we are privileged now to explain that the procedure is as follows:

A small grab sample—say one or two pounds—is taken from the batch and is carefully weighed in an appropriate scale-pan. Next, it is thoroughly wetted in the pan and stirred sufficiently to discharge any air bubbles after which it is again weighed, but this time with the pan and its contents submerged in water. Suitable calculation with the two weights gives the actual weight of the solid components of the concrete.

Next, by careful washing, the fine cement is removed from the mass and the remaining sand and gravel are weighed. The difference is the weight of the cement.

The remaining sand and gravel can then be separated by screens of the mesh designated by specifications. Having the respective weights of the cement, sand, and gravel, it is a simple matter to calculate their proportions.

Whitcomb Company Erects New Factory

The Geo. D. Whitcomb Company, manufacturer of industrial and railway locomotives, has broken ground for the construction of a new factory unit. This expansion will be used primarily for the erection of large oil-electric locomotives from 20 to 100 tons. Two cranes, one of them of 50-ton capacity will serve this new erection bay and facilitate handling of large units. This structure and addition is to be completed within the next 30 to 40 days. Another addition to the manufacturing department is to be started soon.

A large decrease in the quantity of foreign stone used on British roads is indicated in returns issued in London by the National Federation of Granite and Roadstone Quarry Owners. During the first six months of this year the imports of broken roadstone from foreign countries amounted to 113,062 tons as against 164,920 tons during the same period last year. The June imports amounted to 21,743 tons as against 38,313 tons last year. These figures do not include setts and kerb of which about 7,000 tons are imported each month.

Harwich was the principal port of importation, 40,000 tons of foreign broken roadstone being landed there during the six months. Large quantities were also landed at London, Newhaven, Yarmouth, Faversham, Hull, Ipswich and Lowestoft.